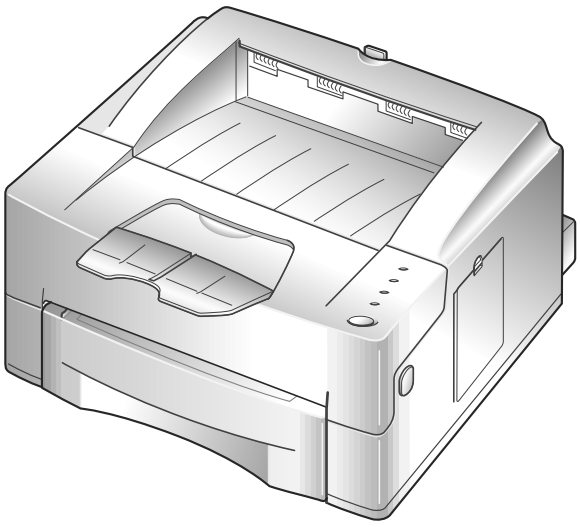
LASER PRINTER

ML-6050
QwikLaser 6050

SERVICE MANUAL

LASER PRINTER



CONTENTS

1. Precautions
2. Specifications
3. Reference Information
4. Disassembly and Reassembly
5. Troubleshooting
6. Exploded Views and Parts List
7. Electrical Parts List
8. Schematic Diagrams

ELECTRONICS

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1. Precautions

1-1. Safety Precautions

Read each caution carefully:

1. Do not use this printer near water or when exposed to inclement weather.
2. Do not place this printer on an unstable cart, stand or table; the product may fall, causing serious damage to the product.
3. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation and to protect the printer from everheating, do not block or cover any of these openings. Do not place the printer in an enclosure unless the enclosure provides adequate ventilation.
4. Never push objects of any kind into the printer through the cabinet ventilation slots as they may touch dangerous high voltage points, create short circuits, cause a fire, or produce an electrical shock. Never spill liquid of any kind on the printer.
5. Do not place the printer in a location where someone may trip on the cords.
6. Select a work surface that is large enough to hold the printer.
7. Position the printer within six feet of the computer and within five feet of an electrical outlet.
8. Operate this printer using the power source (110V, 220V, etc) indicated on the marking label. If you are not sure of the type of power source available, consult your dealer or local power company.
9. If you need to use an extension power cord with this printer, make sure that it uses a three-wire grounded cord and that the total ampere ratings for all of the products using the extension do not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet does not exceed 15 amperes.
10. Do not allow anything to rest on the power cord or data communications cable.
11. Unplug this printer from the wall outlet before cleaning. Do not use liquid cleaners or aerosol sprays. Use a damp cloth for cleaning.
12. Do not touch the surface of the photo-sensitive drum as marks or scratches may impair print quality.
13. Do not expose the drum unit to direct light for prolonged periods.
14. Use only standard papers, OHP films, and approved envelopes. Feed OHP films though the manual feed slot only. See specifications for approved papers and envelopes.
15. Other than replacing consumables such as paper and toner, refer all questions to qualified service personnel.

LASER STATEMENT (LASERTURVALLISUUS)

WARNING: NEVER OPERATE AND SERVICE THE PRINTER WITH THE PROTECTIVE COVER REMOVED FROM LASER/SCANNER ASSEMBLY. THE REFLECTIVE BEAM, ALTHOUGH INVISIBLE, CAN DAMAGE YOUR EYES.

Allonpituus 770-795nm
Teho 0.3mW±0.03mW

CAUTION INVISIBLE LASER RADIATION WHEN THIS COVER OPEN. DO NOT OPEN THIS COVER.

VORSICHT UNSICHTBARE LASERSTRAHLUNG, WENN ABDECKUNG GEOFFNET. NIGHT DEM STRAHL AUSSETZEN.

ATTENTION REYONNEMENT LASER INVISIBLE EN CAS D'OUVERTURE. EXPOSITION DANGERUSE AU FAISCEAU.

ATTENZIONE RADIAZIONE LASER INVISIBILE IN CASO DI APERTURA. EVITARE L'ESPOSIZONE LA FASCIO.

PRECAUCION REDIACION LASER INVISIBLE CUANDO SE ABRE. EVITAR EXPONERSE AL RAYO.

1-2. Servicing Precautions

Note: Requirements for AC power are described on the label affixed to the rear of the printer. Check the AC voltage rating requirement before use.

1. Before disassembly, pull the power plug from the AC power connector.
2. To avoid spilling toner inside the machine, do not turn the printer over or on its side before removing the developer cartridge.
3. Faulty installation of DRAMs may cause permanent damage to the Laser Printer.
4. Use only+5V power for video controller-related circuitry.
5. When replacing parts, use only the same type of part as the original. Replacing components with a second vendor's part may cause faulty operation.
6. Check the insulation between the blades of the AC plug and accessible conductive parts (examples : metal panels and input ports).
7. Insulation Checking Procedure:
   Disconnect the power cord from the AC power source. Connect an insulation resistance meter (500V) to the blades of the AC plug.

   The insulation resistance between each blade of the AC plug and accessible conductive parts (see left) should be greater than 1 megaohm.
8. Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.
9. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the positive lead; always remove the instrument's ground lead last.

1-3. ESD Precautions

Some semiconductor ("solid state") devices are easily damaged from static electricity. Such components commonly are called Electrostatically Sensitive Devices (ESDs); examples include integrated circuits (ICs), Large-Scale Integrated circuits (LSIs), some field-effect transistors, and semiconductor chip components. The following techniques will reduce the occurrence of component damage caused by static electricity:

CAUTION: Be sure the power is off to the chassis or circuit board, and observe all other safety precautions

1. Immediately before handling any semiconductor components assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist strap device. (Be sure to remove the strap before applying power to the unit under test to avoid potential shock.)
2. After removing ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of an electrostatic charge.
3. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESDs.
4. Use only a ground-tip soldering iron when soldering or desoldering ESDs.
5. Use only anti-static solder removal device. Some solder removal devices are not rated as "anti-static;"these can accumulate sufficient electrical charge to damage ESDs.
6. Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are package with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.
7. Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.
8. Minimize body motions when handling unpackaged replacement ESDs. Motion such as your clothes brushing together, or lifting a foot from a carpeted floor can generate enough static electricity to damage an ESC.
9. Handle ICs and EPROMs carefully to avoid bending a pin.
10. Pay attention to the direction of parts when mounting or inserting them on a PCB.
11. Components can be permanently damaged if heated for longer than necessary while welding. All components are susceptible to heat damage.

3. Reference Information

3-1. Abbreviations and Acronyms

Tables 3-1-1 and 3-1-2 list abbreviations and acronyms which may be found in this service manual.

Abbreviations

Abbr	Definition	Abbr	Definition
amps	amperes	motor_pa	Motor phase A
ass'y	assembly	motor_pb	Motor phase B
badac	bad access	mpx	multiplex
bps	bits per second	neg	negative
CBUSY	Command busy	od	open drain
CCLK	Command clock	OSC	oscillator
clk	clock	OUT	output
cm	centimeter(s)	pba	printed board assembly
CMSG	Command message	pcb	printed circuit board
CON	connector	pix	picture
DS	Data Strobe	Pmotor	LSU motor on
EBUSY	Engine Status busy	pos	positive or position
EMSG	Engine Status message	pot	potential
Exitpap	Exit paper	ppm	print pages per minute
GND	ground	PRINT	Print command
HLDA	hold acknowledge	psync	page synchronization
hldar	hold acknowledge received	pwr	power
HLDR	hold request	Q_Lamp	Quenching Lamp
HOR	horizontal	qty	quantity
HSYNC	Horizontal sync	READY	Engine print ready
I/O	Input and Output	sw	switch
in	inch(es) or input	tach	tachometer
INT	Interrupt	thvea	Transfer high voltage Enable
INTA	Interrupt Acknowledge	Vcc	collector supply voltage (dc)
INTR	Interrupt Request	VDI	Video data from controller
lb.	Pound(s)	VDO	Video data output
LDON	laser Diode On	vert	vertical
lin	linearit	Vp-p	peak-to-peak voltage
lock	bus lock	VR	variable resistor
Lready	LSU power ready	mm	millimeter(s)
ADC	Analog to Digital Converter	LED	Light Emitting Diode
ALE	Address-Latch Enable	LSU	Laser Scanner Unit
ASCII	American Standard Code for Information Interchange	MHV	Main High Voltage
		MPU	Micro Processor Unit

Abbr	Definition	Abbr	Definition
BIOS	Basic Input/Output System	NC	No Connection
BPS	Bits Per Second	PCB	Printed Circuit Board
CMOS	Complementary Metal Oxide Semiconductor	PCU	Printed Control Unit
		PLCC	Plastic Leaded Chip Carrier
CPU	Central Processing Unit	PPM	Page Per Minute
DCU	Diagnostic Control Unit	PQFP	Plastic Quad Flat Package
DMA	Direct Memory Access or Dynamic Memory Access	PWM	Pulse Width Modulation
		QFP	Quad Flat Package
DMAC	Direct Memory Access Controller	RAM	Random Access Memory
		ROM	Read Only Memory
DOS	Disk Operating System	SCC	Serial Communications Controller
DPI	Dots Per Inch (resolution)		
DRAM	Dynamic Random Access Memory	SMPS	Switching Mode Power Supply
DVM	Digital Voltmeter	SOP	Small Outline Package
EEPROM	Electronically Erasable Programmable Read Only Memory	THV	Transfer High Voltage
		TS	Tri-State
ICU	Image Control Unit	VCU	Video Control Unit

3-2. Chip Replacement (SMD)

3-2-1. Precautions for Chip Replacement

1. Do not directly touch any portion of the part with the soldering iron. ICs, especially TSOPs, are easily damaged by heat.

2. Use care with the soldering iron tip and avoid rapidly heating parts. Some parts can be damaged by sudden heating. Preheat the part at about 100°C for several minutes before installing it.

3. Use a soldering tip temperature of about 240°C. For larger parts, use a slightly higher temperature (about 280°C).

4. The thin (0.3mm) solder for miniature parts does not contain adequate flux. Supplementary flux is thus needed in most cases.

   Computer, OA and A/V systems are manufactured using flux which can be cleaned by water. When you replace the part or when troubleshooting, use proper flux and solder which can be cleaned by water.
   Improper flux may cause the soldering area to corrode and may cause a fatal system error.

5. Use care not to damage the circuit pattern, especially when desoldering. Because of the many pins, cleanliness of the pattern is extremely important after removing an IC.

6. Use care to avoid solder bridges. Remove any bridges that occur.

7. Position the part carefully. This also affects the soldering operation. Be very precise in positioning the IC. Soldering opposite pins first holds the IC in place and makes soldering the other pins easier.

8. Do not reuse removed parts.

9. Clock for solder joints, especially miniature parts with small lead.

10. A defective trimming resistor cannot be adjusted externally. Replace with an ordinary variable resistor.

11. Always inspect the work with a magnifying lens. Check after installing cold solder joints, etc.

3-2-2. Tools for Chip Replacement

The tools for chip replacement are as follows:

· Thin tip type soldering iron.
· Small flat-blade tip type soldering iron
· Special desoldering tip iron
· Air-blower Unit
· Flat Package Pick-up
· Flux that can be cleaned by water
· 0.3mm thin solder that can be cleaned by water
· Desoldering wire
· Tweezers

3-2-3. Chip Resistor and Chip Capacitors

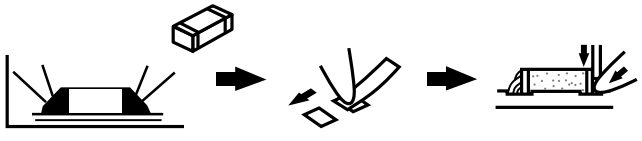
TYPES

The types of chip resistors and chip capacitor are as follows:

· Thick Film Chip Resistors
· Carbon Film Chip Resisters
· Metal Film Chip Resisters
· Chip Ceramic Capacitors
· Chip Trimming Resisters

REMOVING

1. Using Two soldering irons:
   a. Use thin tip soldering irons
   b. Use soldering tip temperature of about 280°C.
   c. Simultaneously heat both ends of the part.
   d. While heating, grasp the part with the tips of the soldering irons and remove it.
   e. Use desoldering wire to completely remove the old solder from the part location on the board. A clean pattern for installing the new part is very



INSTALLING

1. Clean the area where the new part is to be mounted.
2. Apply a water soluble flux.
3. Set part correctly into position and prevent is from shifting.
4. Bring the soldering iron tip close to the part contact without actually touching it. Melt thin (0.3mm) solder between the tip and part so that it flows into the part contact.
5. Check work quality with a magnifying lens.

3-2-4. Chip Tantalum Capacitors and Chip filters

TYPES

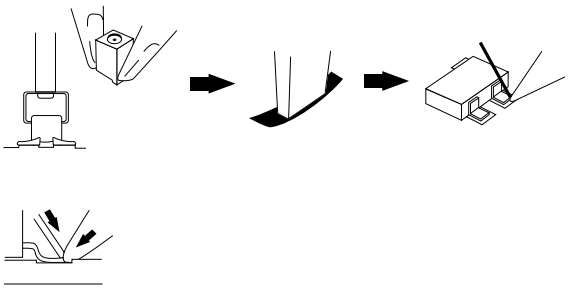
The types of chip tantalum capacitors and chip filters are as follows:

· Chip Inductors
· Chip Tantalum Capacitors
· Chip Tantalum Electrolytic Capacitors
· Chip Aluminum Electrolytic Capacitors
· Chip Transformers
· Chip Filters

REMOVING

1. Using a special desoldering iron:
   a. Select soldering tip according to part size.
   b. Bring the tip into contact with the solder points.
   c. When the solder melts, remove the part.
   d. Remove the old solder with desoldering wire.

2. Using a special desoldering iron:
   a. Use small flat-blade tips.
   b. Heat both ends of the part simultaneously.
   c. When the solder melts, grasp and remove the part with the soldering iron tips.



INSTALLING

1. Clean the area where the new part is to be mounted.
2. Apply a water soluble flux.
3. Set part correctly into position and prevent it from shifting.
4. Use a sharp soldering iron tip. Bring the tip close to the part contact without actually touching it. Melt thin (0.3mm) solder between the tip and part so that it flows into the part contact.
5. Check work quality with a magnifying lens.

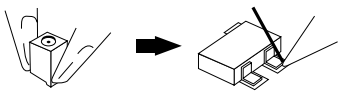
3-2-5. Chip VRs, Chip Trimmer Capacitors, Diode and Tr.

TYPES

The types of parts are as follows:
· Chip VRs
· Chip Trimmer Capacitors
· Diode
· Transistors

REMOVING

1. Using two soldering irons.
   a. Use small-flat-blade tips.
   b. Heat the leads of the part simultaneously.
   c. When the solder melts, grasp and remove the part with the soldering iron tips.



INSTALLING

1. Clean the area where the new part is to be mounted.

2. Apply a water soluble flux.

3. Set part correctly into position and prevent is from shifting.

4. Use a sharp soldering iron tip. Bring close to the part contact without actually touching it. Melt thin (0.3mm) solder between the tip and part so that it flows into the part contact.

3-2-6. Chip ICs

TYPES

The types of chip ICs are as follows:
1. SOP (Small Outline Package) IC
2. SSOP (Shrink Small Outline Package) IC
3. VSOP (Very Small Outline Package) IC
4. QFP (Quad Flat Package) IC
5. VQFP (Very Quad Flat Package) IC
6. PLCC (Plastic Leaded Chip Carrier) IC
7. TSOP (Thin Small Outline Package) IC

REMOVING

1. Using special desoldering iron:
   a. Select the tip according to the size shape of the IC.

   b."Tin" the tip with a small amount of the IC leads.
   c. Set the tip squarely over the IC leads.
   d. When the solder melts, carefully twist the iron.
   e. Raise and remove the IC.

2. Using a shaped air-blower unit:
   a. Select the correct nozzle.
   b. Select the temperature and air-blow (suggested : temperature : 7, air-blow:4)
   c. Engage the IC removing tool.
   d. Use the air-blow the preheat the IC for about 5 seconds, then heat with the nozzle until the IC remove lifts the part from the board.

INSTALLING

1. Use desoldering wire to remove the previous solder

2. Clean the location.

3. Apply water soluble flux.

4. Position the IC and solder two pins at opposite sides.

5. Use a sharp tipped soldering iron and carefully solder each pin. (After gaining experience, a thicker tip can be used for better work efficiency)

6. Remove any solder bridges with desoldering wire.

3-3. Recommended Test Equipment

Samsung recommends the following equipment when servicing the Laser Printer.

Digital Multimeter	A digital multimeter with attached LED or LCD 4-digit Panel
Oscilloscope	A digitizing oscilloscope which can measure more than 100MHz
High Voltage Probe	A high voltage probe which can measure about less than 10KV
DCU (Diagnostic Control Unit)	DCU can be supplied from Samsung which can easily shows the engine's error status

Table 3-4-1 Equipment List

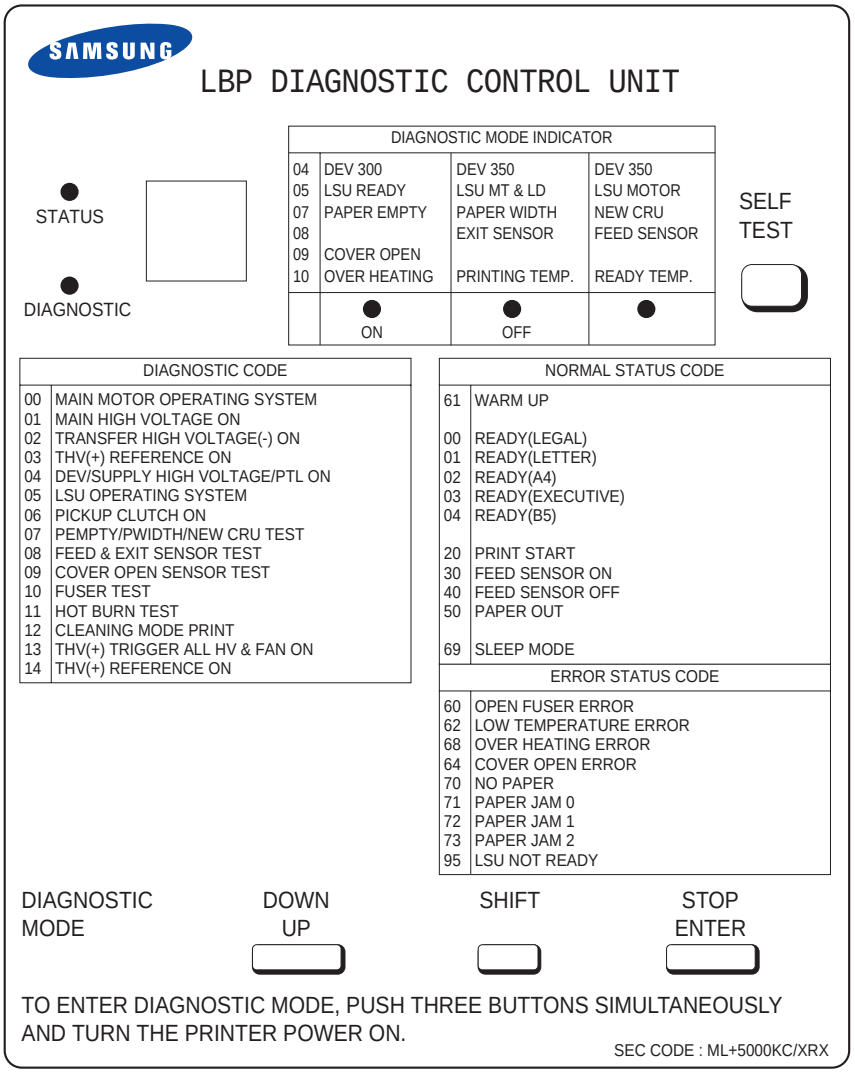


Figure 3-4-1 DCU

3-4. DCU Control

3-4-1. DCU Setup

1) Connect DCU to Controller Board Connector J6 (4 pins) or Engine Board CN2 (4pins).
2) To apply power, simultaneously press and hold down [DOWN], [SHIFT], and [STOP] keys. '78' is displayed.
3) After 2-3 seconds, release the keys. '00' is displayed.
4) Press [UP] or [SHIFT]+[DOWN] keys until the desired code number is displayed in the DCU display.
5) Press [ENTER] to begin operating.
6) Example : Select numbers '13' and '14' to adjust the electrophotography trigger voltage.
7) To end operation, press [SHIFT] and [STOP] keys.

3-4-2. DCU Diagnostic Mode

The DCU is used to diagnose the printer malfunction status.

Display	Diagnostic Code Description
00	MAIN MOTOR OPERATING SYSTEM
01	MAIN HIGH VOLTAGE ON
02	TRANSFER HIGH VOLTAGE(-) ON
03	THV(+) REFERENCE ON
04	DEV / SUPPLY HIGH VOLTAGE / PTL ON
05	LSU OPERATING SYSTEM
06	PICKUP CLUTCH ON
07	PEMPTY / PWIDTH / NEW CRU TEST
08	FEED & EXIT SENSOR TEST
09	COVER OPEN SENSOR TEST
10	FUSER TEST
11	HOT BURN TEST
12	CLEANING MODE PRINT
13	THV(+) TRIGGER ALL HV & FAN ON
14	THV(+) REFERENCE ON

3-4-3. DCU Error Status Code

DCU error code will indicate malfunction area of the machine.

Display	Diagnostic Code Description
60	OPEN FUSER ERROR
62	LOW TEMPERATURE ERROR
68	OVER HEATING ERROR
64	COVER OPEN ERROR
70	NO PAPER
71	PAPER JAM 0
72	PAPER JAM 1
73	PAPER JAM 2
95	LSU NOT READY

3-4-4. Error Solution

Display	Solution
60, 62, 68	1. Measure the resistance of the AC connector on the Fuser. Normal resistance is 2-4 ohmsfor 110V, 6-8 ohms for 220V. 2. Check if the fuser lamp works properly. 3. Measure the resistance at Q101 on the engine board. If abnormal, replace Q101, Q3, PC151, Q8.
70	1. Make sure that paper is loaded in the cassette. 2. Replace OP2 sensor (photo interrapter). 3. Check if the feed clutch works properly. 4. If abnormal, replace the feed clutch or Q4 on the engine board.
71	1. Make sure that paper is loaded in the cassette. 2. Check for pick-up unit. If it is heavily worn, replace it with new one. 3. Replace OP1 sensor.
72, 73	1. Make sure that the paper being used meets the specification. 2. Check if there is a paper jam in the fuser. 3. Replace OP1, OP3 on the engine board. 4. Check the fuser roller for any dirt. If dirty, clean the roller.
72, 73	1. Make sure that the paper being used meets the specification. 2. Check if there is a paper jam in the fuser. 3. Replace OP1, OP3 on the engine board. 4. Check the fuser roller for any dirt. If dirty, clean the roller.
95	1. Check for U205 on the engine board. 2. Replace LSU. 3. Measure the resistance at R62 and R8. If abnormal, replace them.

Memo

2. Specifications

Note: It is subject to change without notice.

Item	Specification & Description
Engine	MLE-6000
Print Speed	12PPM (A4 Size, 5% Character Pattern)
Resolution	True 600 x 600 dpi
Source of Light	Laser Diode (LSU:Laser Scanner Unit)
Print Method	Non-impact Electrophotography
Feed Method	Cassette & Manual, Option Feeder
Paper Handling (input)	*Size (1) Standard : A4, Letter, Legal, B5, Executive, Folio (2) Envelope : manual feed only Paper Type / Paper size(mm^2) Monarch / 98.5 x 190.5 Com-10 / 104.9 x 241.3 Intl-DL / 110 x 220 Intl C5 / 162 x 229 (3) Universal type Length : 150 ~ 356 mm Width : 90 ~ 216 mm *Weigh : For Cassette, 60 ~ 90 g / m^2 For Manual, 60 ~ 120 g / m^2 *Recommended Paper USA : X420, X4024, NEKOSA, BOISECASCADE EC : REFLEX, ADAGIO Transparancies : 3M(CG3300 or 3360) Label : AVERY 53XX series
Paper Handing (output)	Face Down : 250 sheets, Face Up : 1 sheet
Feed Capacity	250 sheet tray one option 250 sheet Drawer
Warm-up time	70 seconds or less (23°C, 50%)
First Print Time	14 seconds or less (Fast Mode)
Power Rating	AC100~120V / 220~240V(±15%), 50 / 60Hz (±3%)
Power Consumption	300W Printing Avg / 14W pring sleep
Power Saving	During Sleep : Max 28 W
Consumption	Less than 30W during 1 hour when it turned on
Certification & Compliance	C-UL, TUV, FCC, CDRH, CE, CB

Item	Specification & Description
Acoustic Noise	Stand by : Less than 36dB, Operating : Less than 49dB
Toner Supply	Print Cartridge
Expected Life Span	150,000 sheets
Operating Environment	Temperature : 10~30°C, Humidity : 20~80%RH
Storage Environment	Temperature : 0~35°C, Humidity : 10~90%RH
Weigh	Net : Max 11Kg, Gross : 12Kg
External Dimension	360 (W) x 368 (D) x 220 (H)mm
Print Cartridge	Life Span : 5,000 pages, 5% Pattern Developing : Non-magnetic Contact Developing Charging : Conductive Roller Charging Density Adjustment : 3 step (Light, Medium, Dark) Toner Supply Method : Exchanging the Developer Toner Checking Sensor : None Transfer System : Conductive Roller Transfer Fusing System : Temperature & Pressure Ozone Emission : Less than 0.1 PPM
Emulation	PCL5e, PCLXL (compatible with HP LaserJet 5P)
Font	1 bitmap 45 scalable (35 intelligent, 10 truetype)
CPU	ARM7 KS32C6100
RAM Memory	Standard 4M byte (16M bit x 2) Option SIMM Module ; 4, 8, 16, 32M byte *Refer to Operator's Guide for instructions on SIMM installation.
ROM	2M byte (8M bit x 2 : Program) Flash Memory
EEPROM	512 bytes
Interface	Bidirectional Parallel Standard - IEEE 1284 COMPATIBLE MODE - IEEE 1284 NIBBLE MODE - IEEE 1284 BYTE MODE - IEEE 1284 ECP WITHOUT RLE - IEEE 1284 ECP WITH RLE

4. Disassembly and Reassembly

4-1. General Precautions on Disassembly

When you disassemble and reassemble components, you must use extreme caution. The close proximity of cables to moving parts makes proper routing a must. If components are removed, any cables disturbed by the procedure must be restored as close as possible to their original positions. Before removing any component from the machine, note the cable routing that will be affected.

Whenever servicing the machine, you must perform as follows:

1. Remove the paper cassette(s), and the print cartridge. Do not expose the cartridge to direct room light or sun light, and be careful not to scratch the drum surface.

2. Turn the power switch off.

3. Unplug all the cables from the printer.

4. Replace with only an authorized component.

5. Do not force to open or fasten a plastic material component.

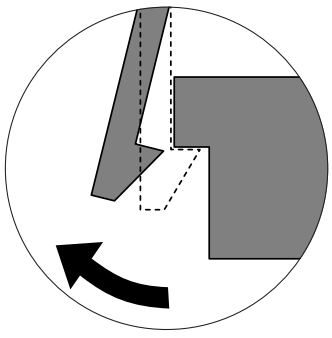
6. Be careful no obstacles are included when you reassemble components.

7. When you reassemble components, be careful small size components are located in place.

8. If you turn the machine over to replace some parts, toner or paper particles may contaminate the LSU window. Protect the LSU window with clean paper.

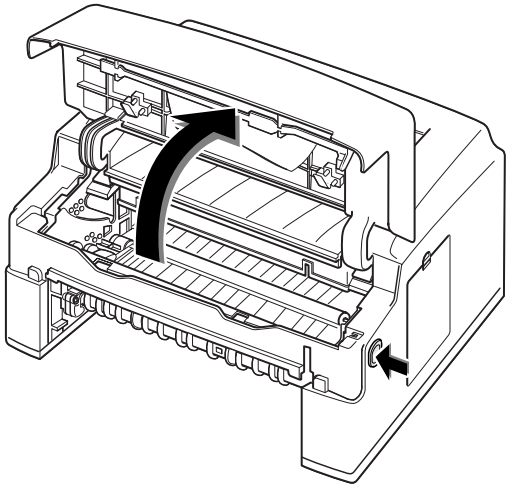
Releasing Plastic Latches

Many of the parts are held in place with plastic latches. The latches break easily; release them carefully. To remove such parts, press the hook end of the latch away from the part to which it is latched.

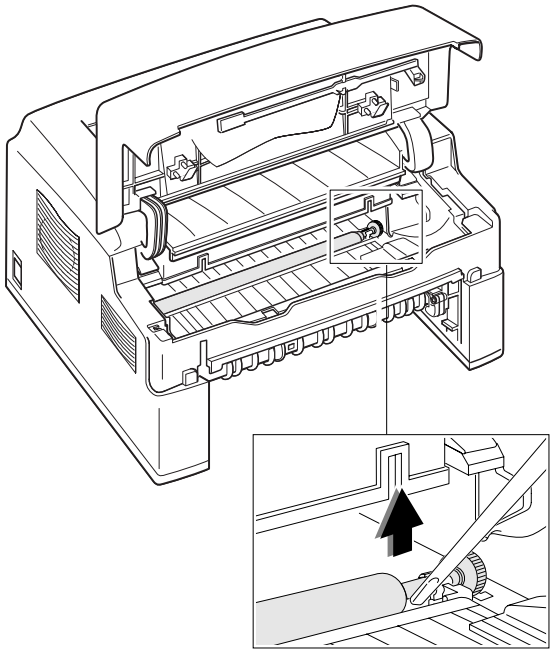


4-2. Transfer Roller

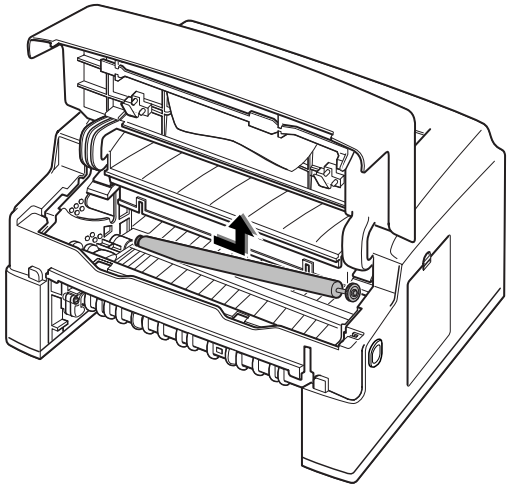
1. Press the cover open switch and raise the printer cover.



2. Use a phillips screwdriver to release the right end of the roller.

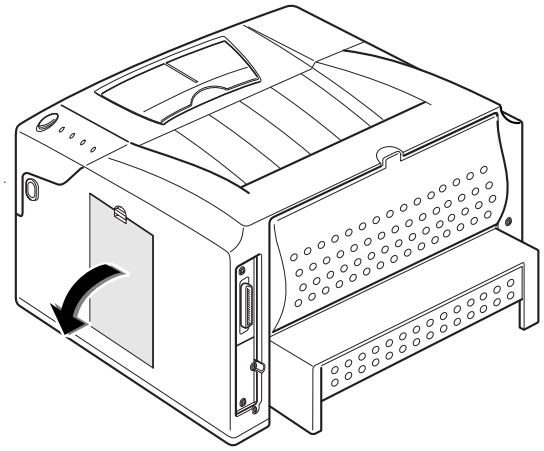


3. Pull the roller slightly to the right to release the left end of the roller, then take it out.

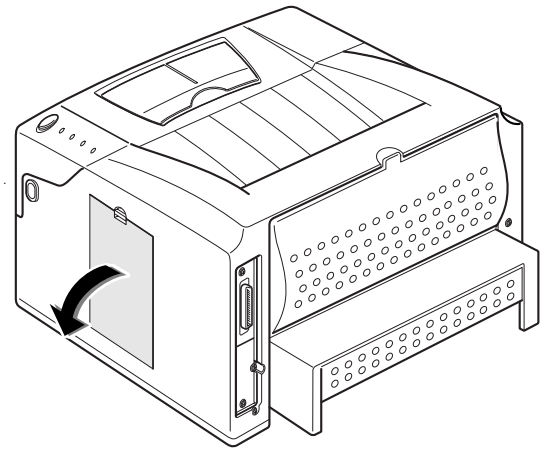


4-3. Controller Board

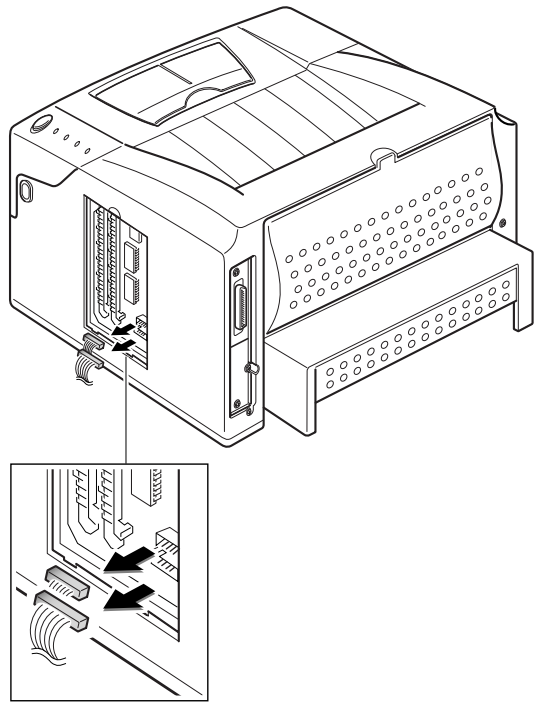
1. Remove the cover located at the right side of the printer.



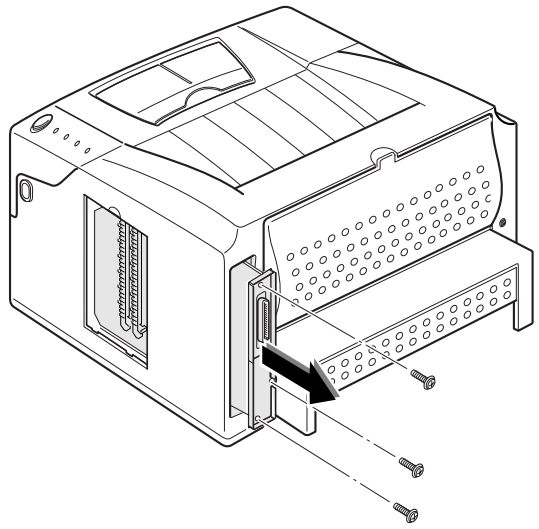
2. Remove one screw. Slide the shield cover in the direction of OPEN arrow marked on the cover, then remove the cover.



3. Unplug two connectors from the board.



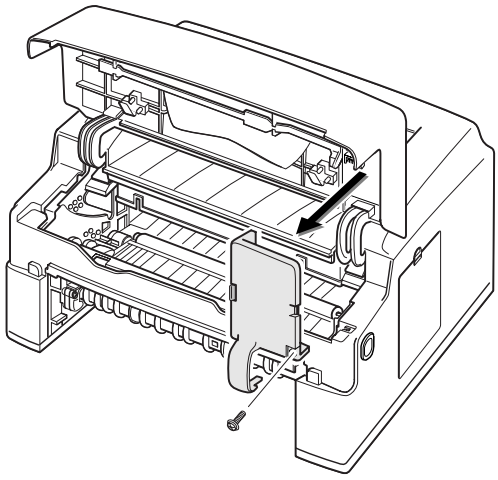
4. Remove three screws securing the board and pull the board out of the printer.



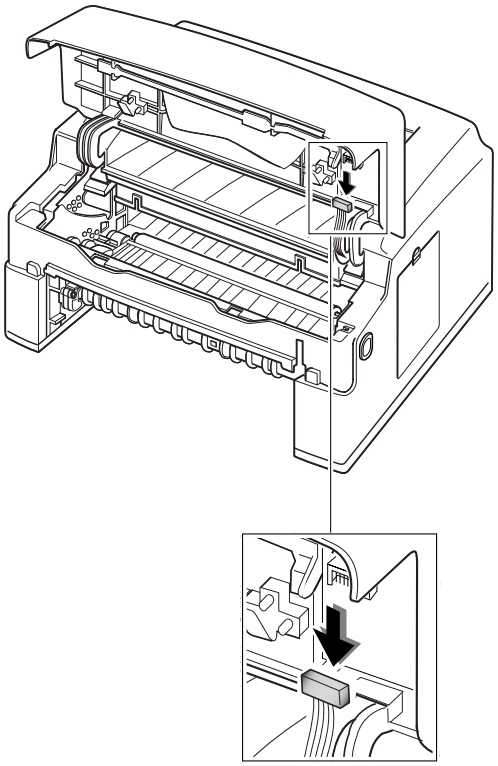
4-4. Panel Board

1. Press the cover open switch and raise the printer cover.

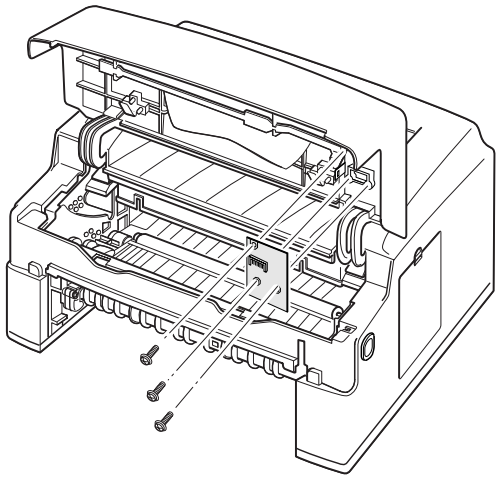
2. Remove the panel cap.



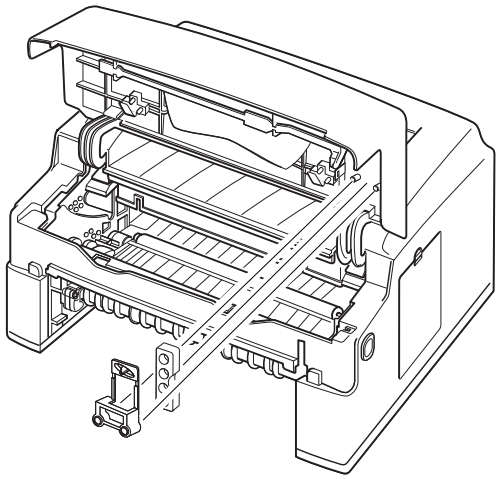
3. Unplug one connector from the panel board.



4. Remove three screws from the board, and remove the board.

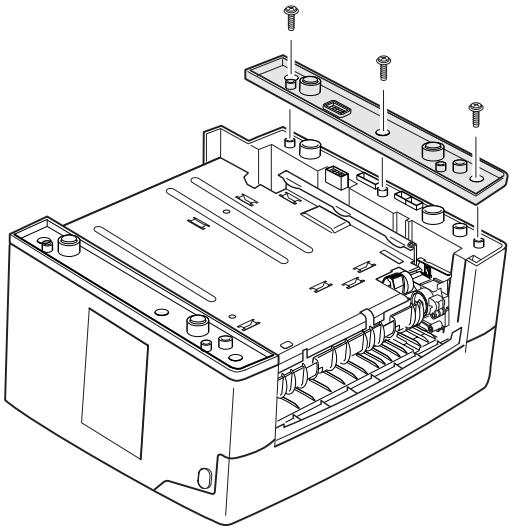


5. Remove the Window LED and button panel LED.

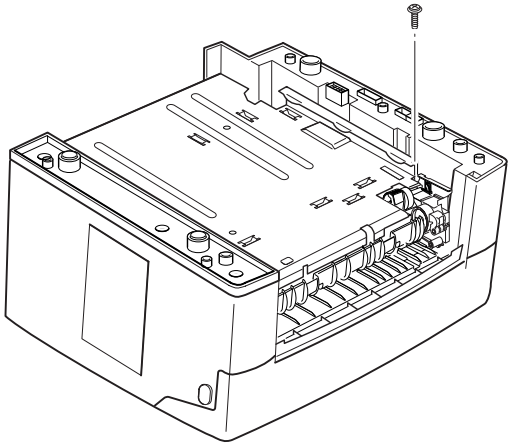


4-5. Pickup Assembly

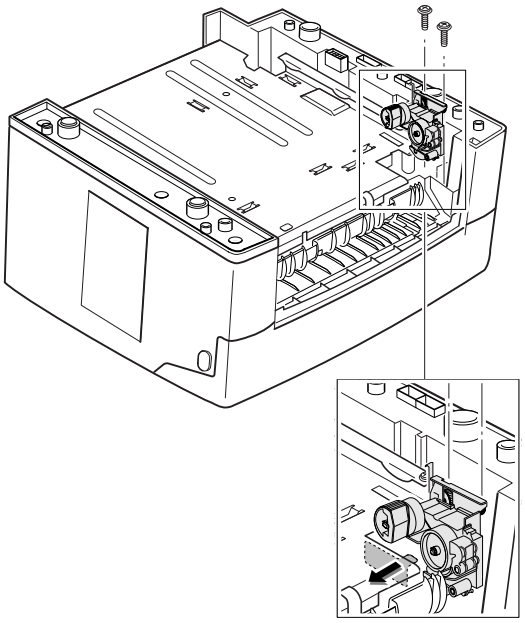
1. Turn the printer over. Remove three screws from the left base bracket, and take the bracket out.



2. Remove one ground screw.

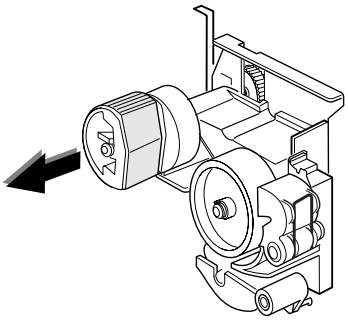


3. Remove two screws securing the pickup assembly and take the assembly out.

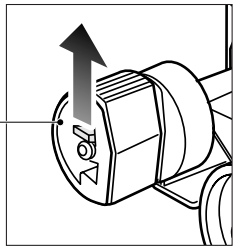


Push the solenoid if you have difficulty to remove the pickup assembly.

4. Check the pickup rubber wear. If the rubber is heavily worn, replace it with a new one.



Squeeze this tab to remove the rubber.

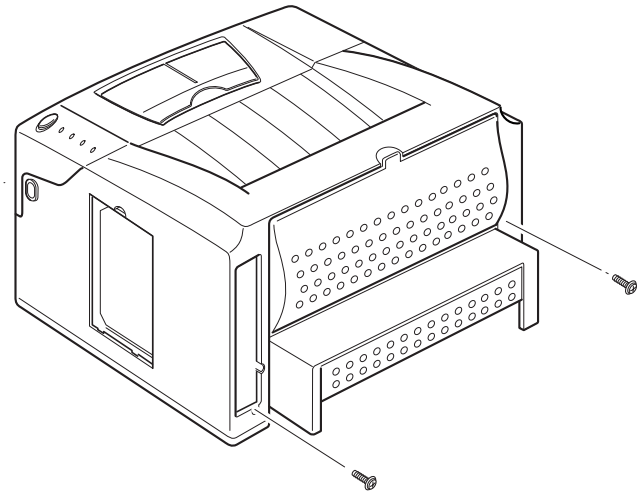


4-6. Main Cover

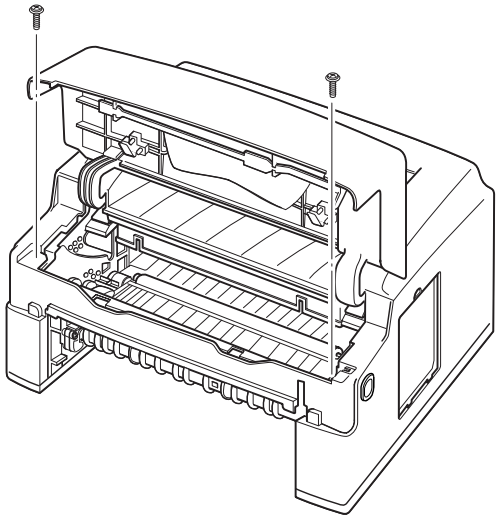
1. Before you remove the cover, you should remove:

   -Controller Board (see page 4-3)

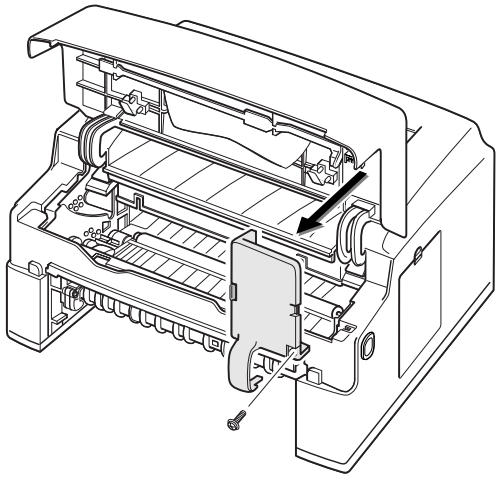
2. Remove two screws at the back of the printer.



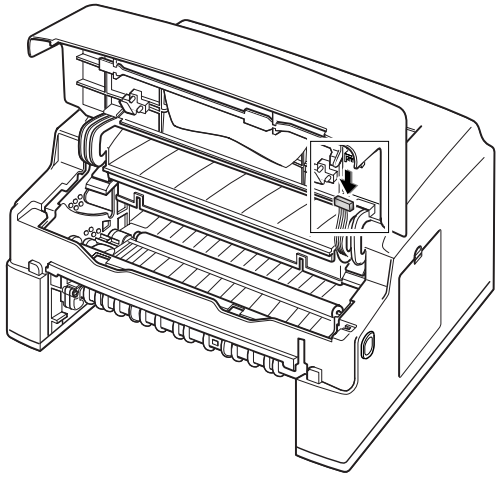
3. Open the printer cover, and remove two screws.



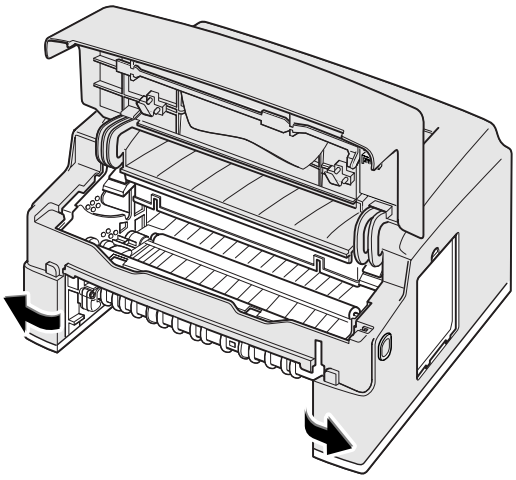
4. Remove the panel cap inside the operator panel.



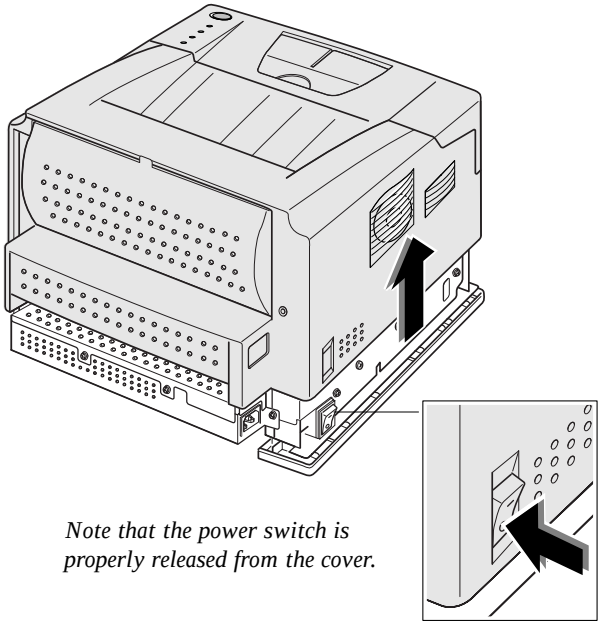
5. Unplug one connector from the panel board.



6. Unlatch the front ends of the cover.



7. Slide the main cover upward, out of printer.



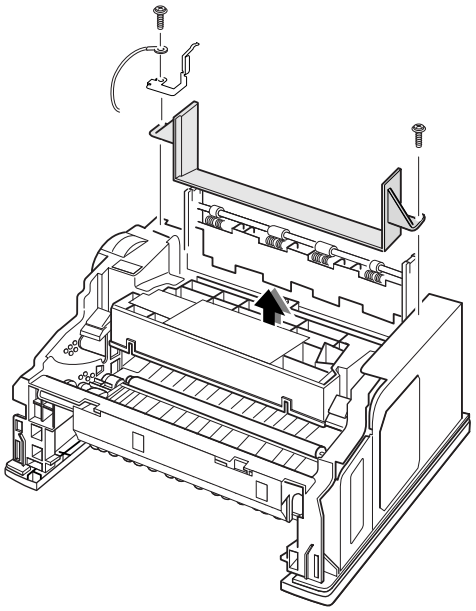
Note that the power switch is properly released from the cover.

4-7. LSU

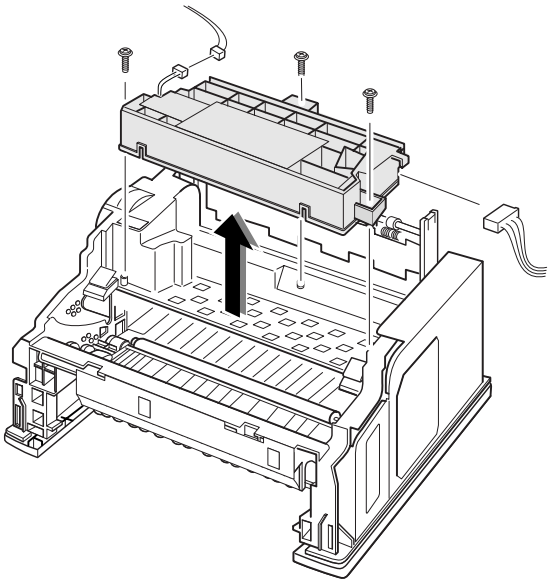
1. Before you remove the LSU, you should remove:

   -Controller Board (see page 4-3)
   -Main Cover (see page 4-6)

2. Remove two screws securing the fuser cover, and remove the fuser cover.



3. Remove three screws, and remove the LSU. Then unplug two connectors from the LSU.

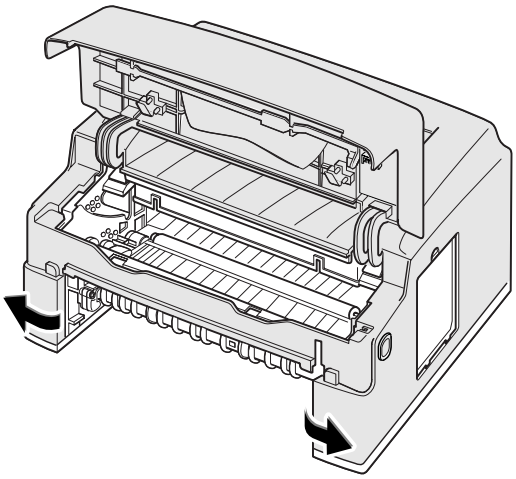


4-8. Exit Assembly

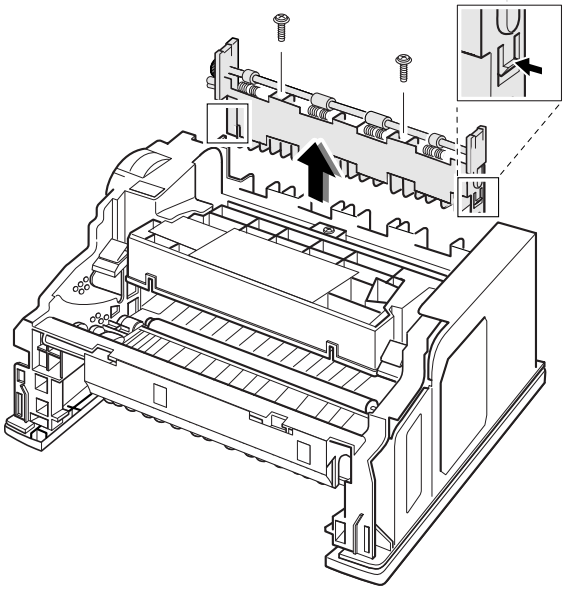
1. Before you remove the exit assembly, you should remove:

   -Controller Board (see page 4-3)
   -Main Cover (see page 4-6)
   -Fuser Cover (see page 4-10)

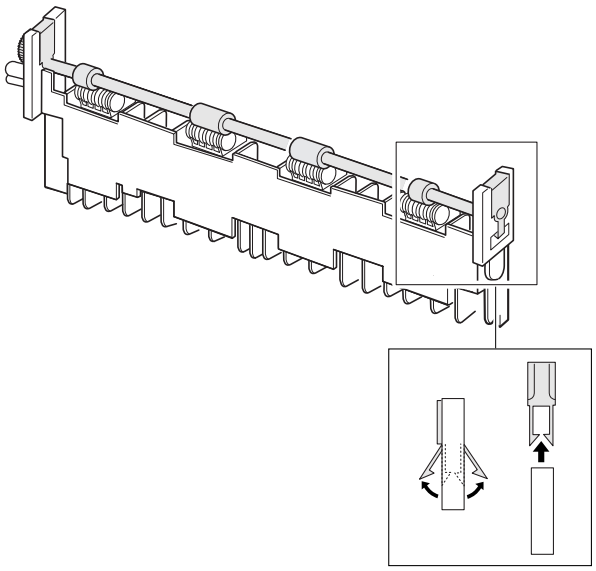
2. Remove three screws, and remove the bracket.



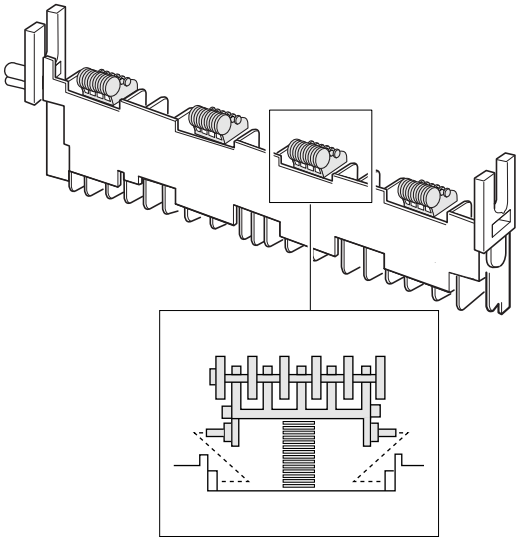
3. Remove two screws, unlatch the exit tray and take it out.



4. If you want to remove the roller shaft, unlatch both ends of the shaft and take it out.



5. If you want to remove the exit rollers, sqeeze the bottom of roller and take it out.

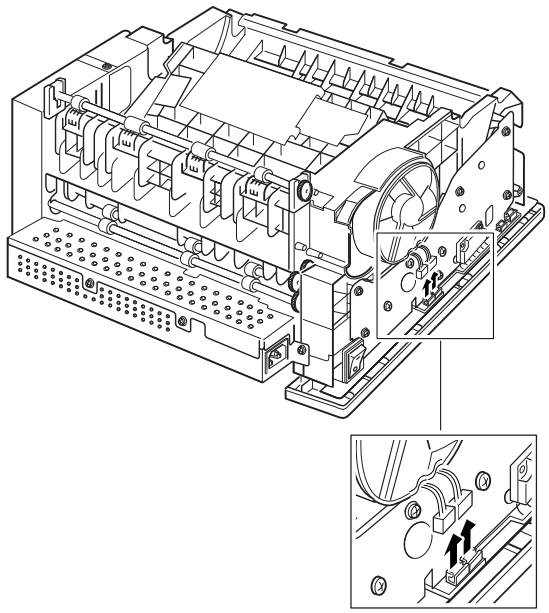


4-9. Drive Assembly and Fan

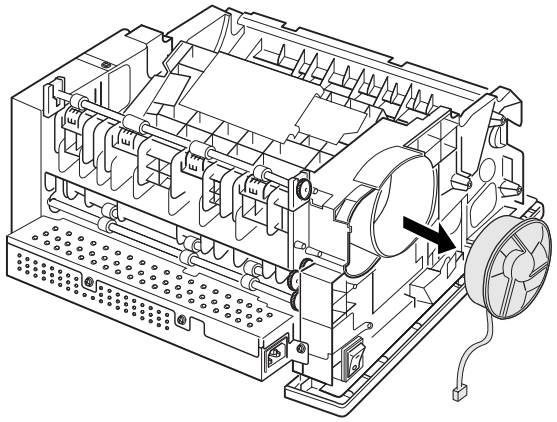
1. Before you remove the drive assembly or fan, you should remove:

   -Controller Board (see page 4-3)
   -Main Cover (see page 4-6)

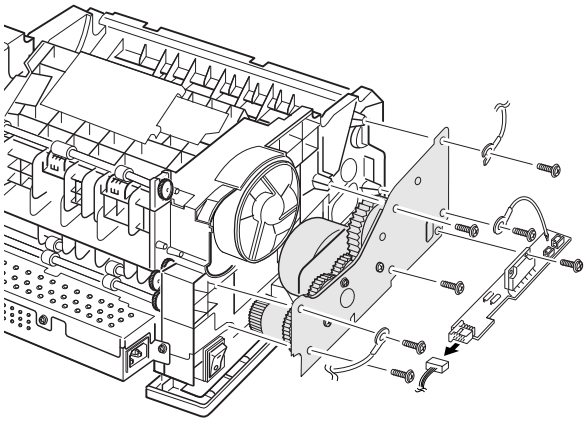
2. Unplug two connectors.



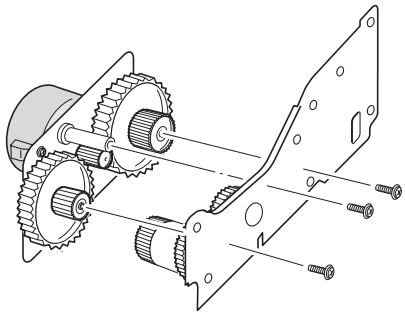
3. If you want to replace the fan, take the fan out.



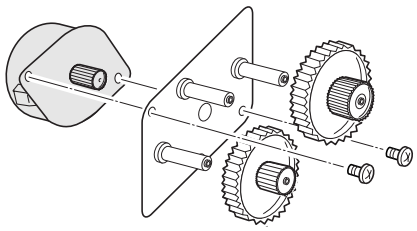
4. Remove seven screws securing the drive assembly from the gear bracket, and remove the drive assembly and motor drive board. Unplug one connector from the board.



5. If you want to remove the motor from the drive assembly, remove three gold screws securing the motor assembly to the gear bracket.



6. Remove the motor assembly. Remove two screws securing the motor to the motor bracket, then take the motor out.

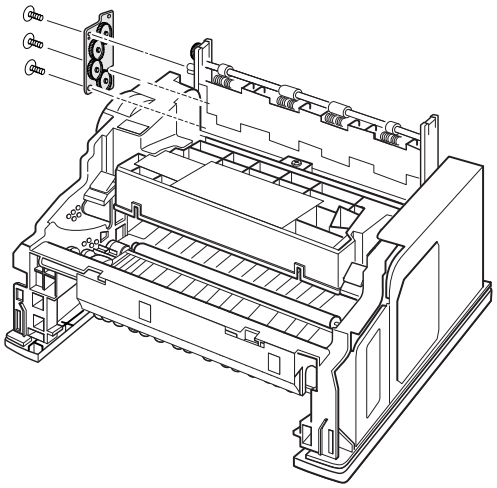


4-10. Fuser

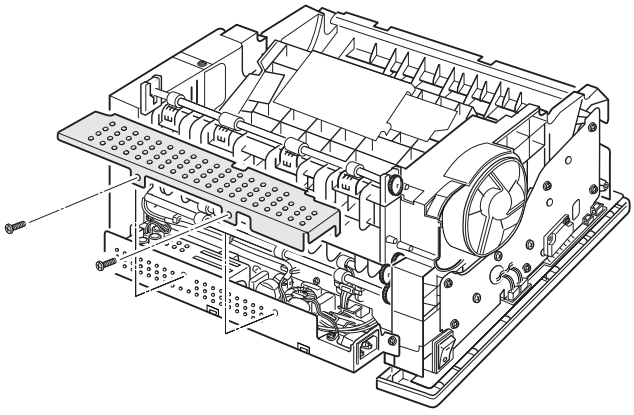
1. Before you remove the fuser, you should remove:

   -Controller Board (see page 4-3)
   -Main Cover (see page 4-6)

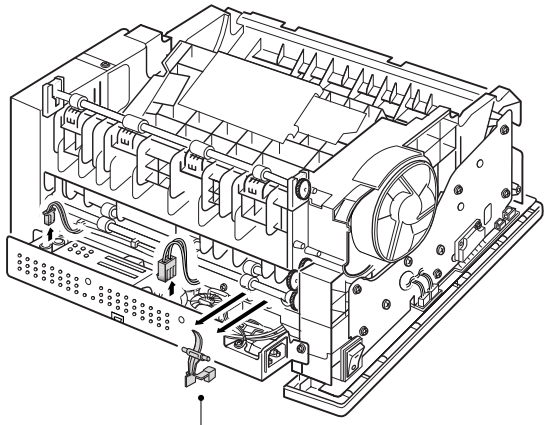
2. Remove three screws, and remove the bracket.



3. Remove two screws from the SMPS bracket.

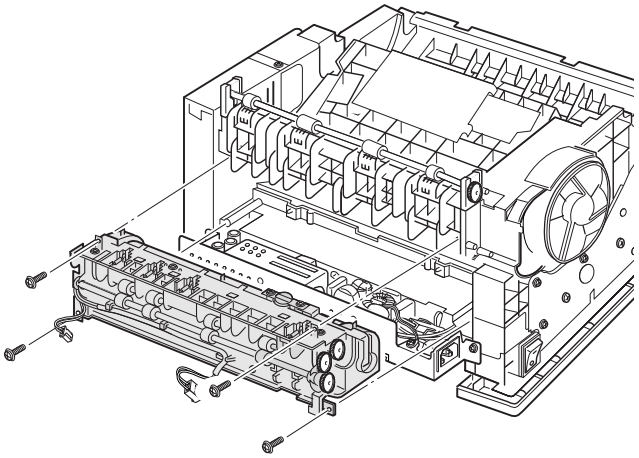


4. Remove the exit actuator. Unplug two connectors.



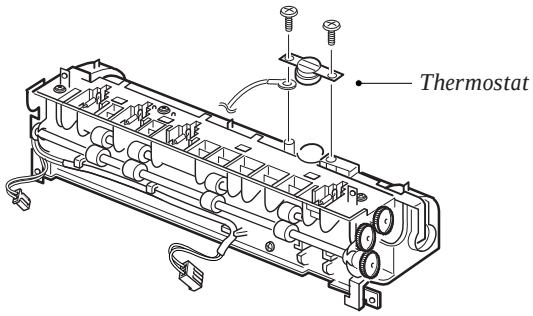
Exit Actuator

5. Remove four screws, and remove the fuser assembly.



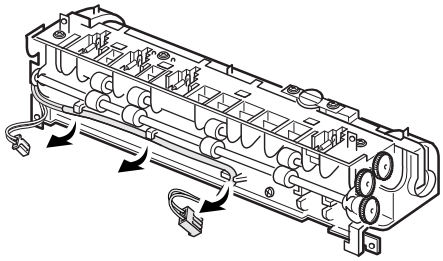
To remove the thermostat from the fuser assembly :

Remove two screws, and take the thermostat out.

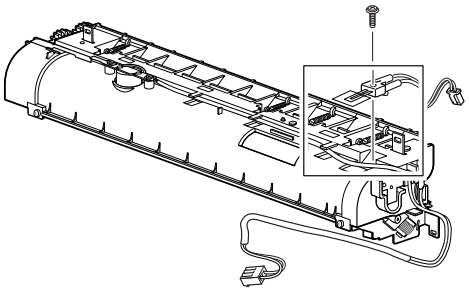


To remove the thermistor from the fuser assembly :

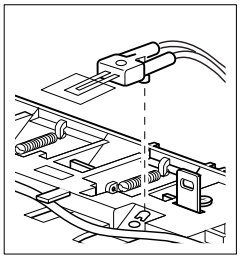
1. Release the wire from the three holders.



2. Remove one screw, then take the thermistor out.

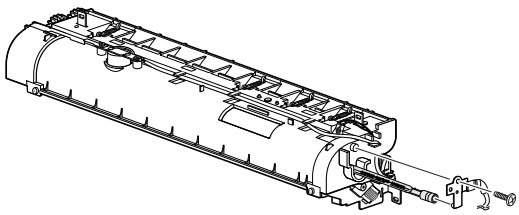


Note: When you reassemble the thermistor, make sure that it puts in place.

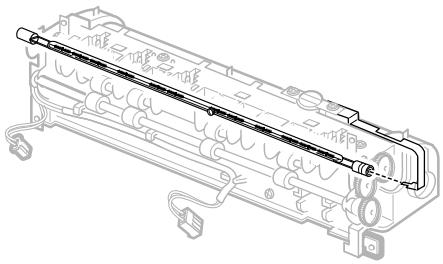


To remove the halogen lamp from the fuser assembly :

Remove one screw.



Note: When you reassemble the halogen lamp, make sure that it is inserted into the slot properly.



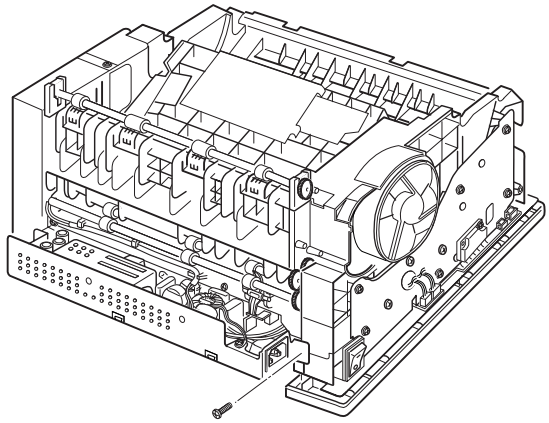
4-11. Engine Board and Miscellaneous

1. Before you remove the engine board, you should remove:

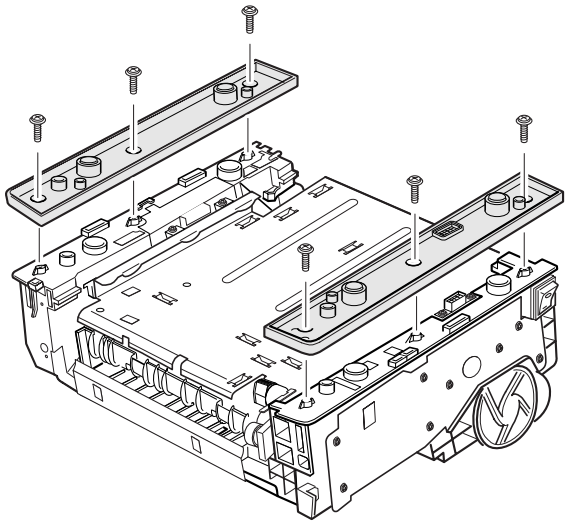
   -Controller Board (see page 4-3)
   -Main Cover (see page 4-6)

2. Remove the SMPS bracket as described in '4-10 Fuser' and unplug four connectors.

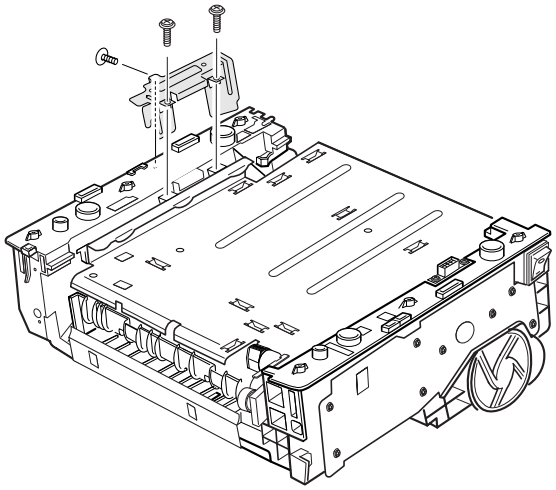
3. Remove one screw from the engine board.



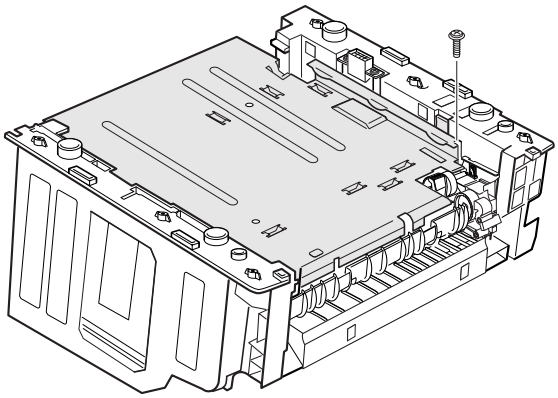
4. Turn the printer over. Remove six screws from the left and the right base brackets, and take them out.



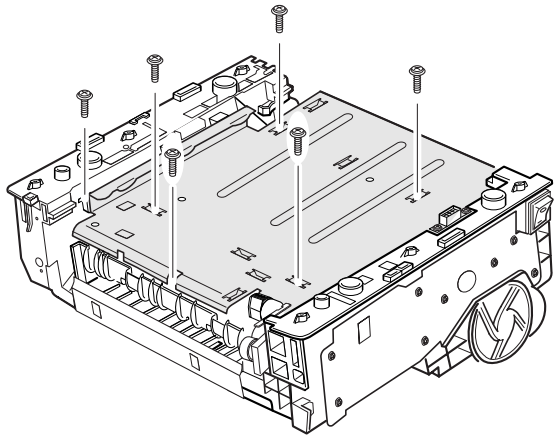
5. Remove three screws securing the ICU ground, and remove the ICU ground.



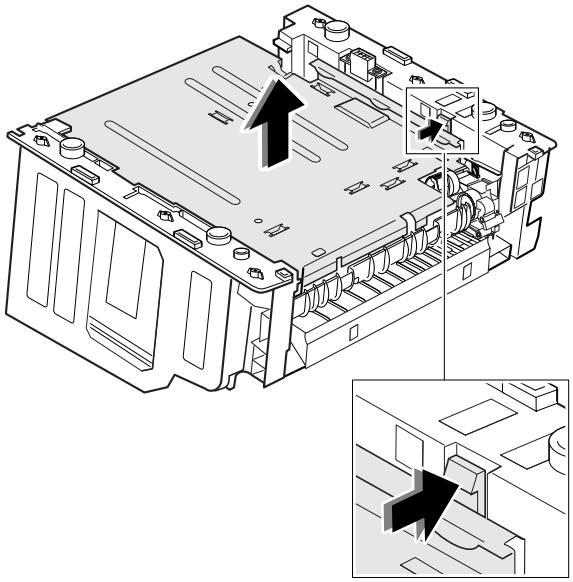
6. Remove one ground screw.



7. Remove six screws securing the PCU shield.

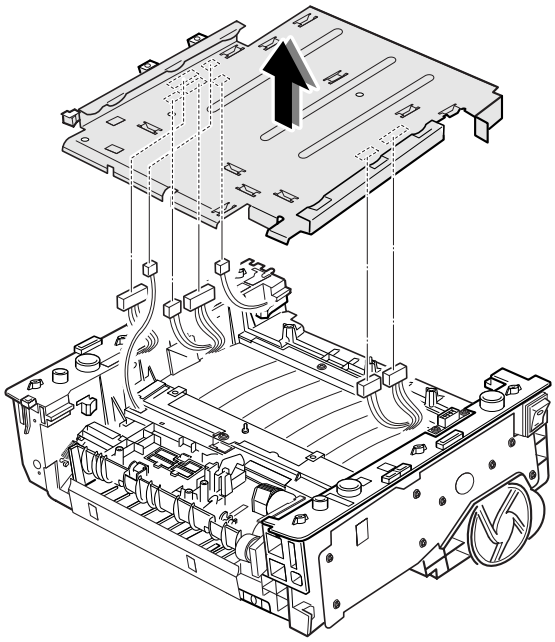


8. While you push the stopper to release the PCU shield, take the PCU shield out of the printer.



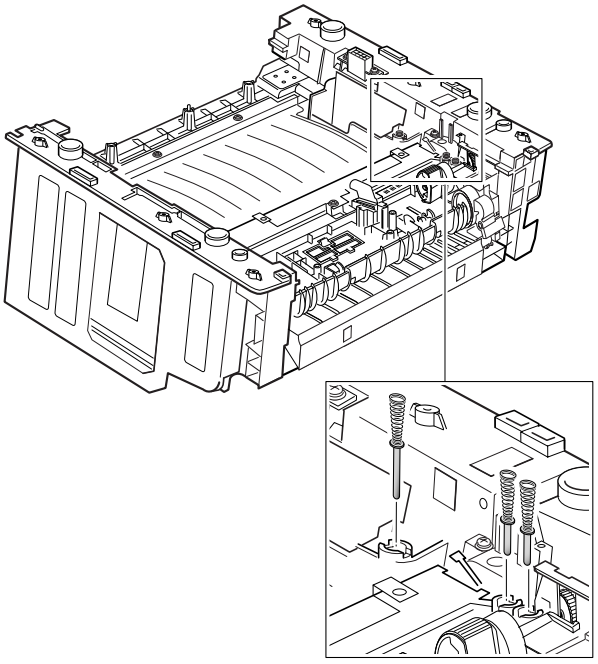
Stopper

9. Unplug all connectors from the PCU shield, and remove the shield.



To replace HV terminals :

Remove the terminals.

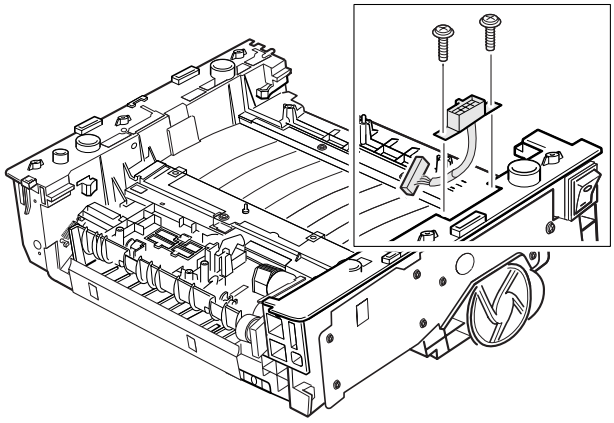


HV terminals

Note: When you replace with new ones, be careful that they are inserted in place.

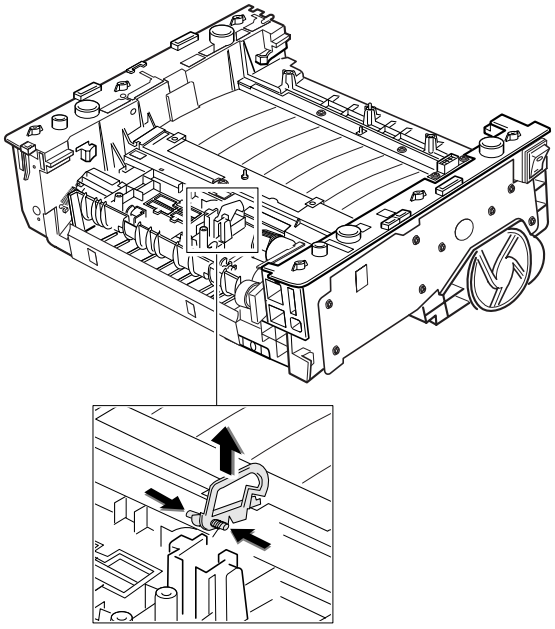
To replace the SCF connector :

Remove two screws and take it out.



To replace the paper empty sensor :

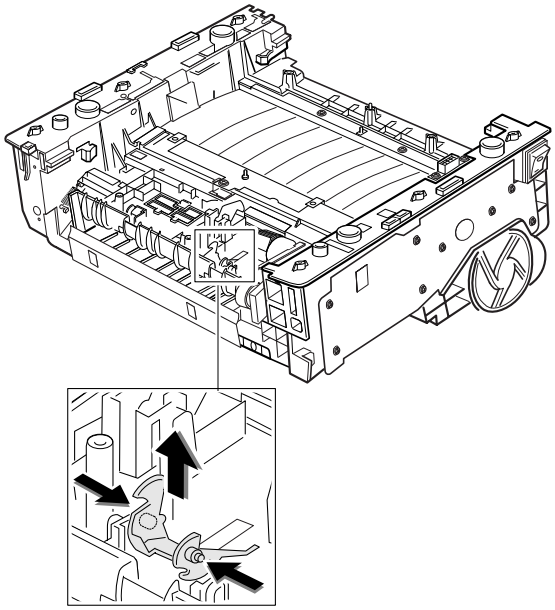
Take the sensor out while you push the both ends of the sensor inward.



Paper empty sennsor

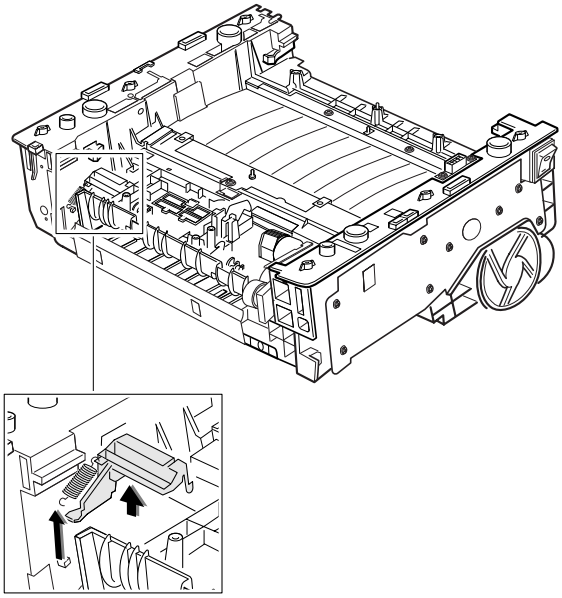
To replace the pickup sensor :

Take the sensor out while you push the both ends of the sensor.



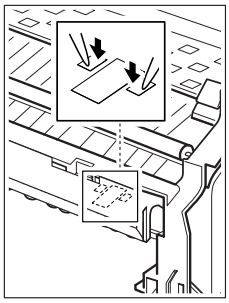
To replace the cover open sensor :

Remove the spring and take it out.

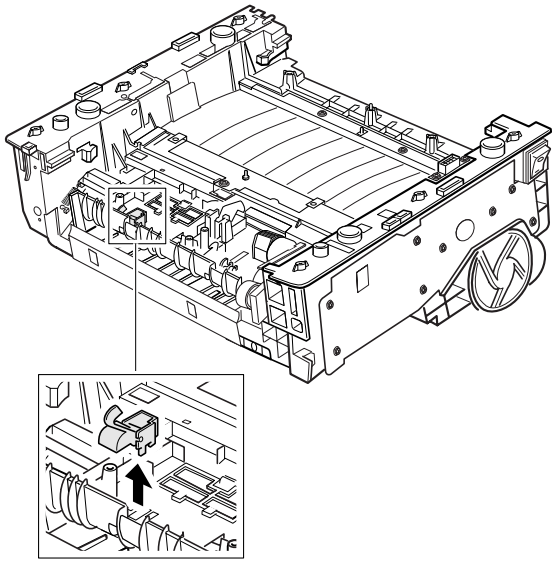


To replace the actuator :

1. Turn the mechanism back and push down the points as shown to unlatch the actuator.

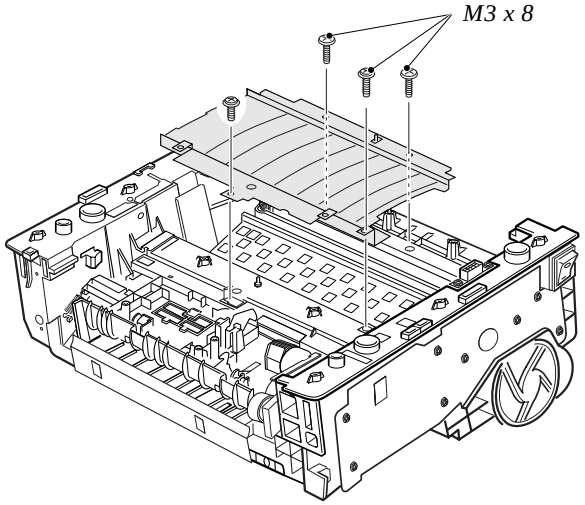


2. Turn the unit over, and remove the actuator.



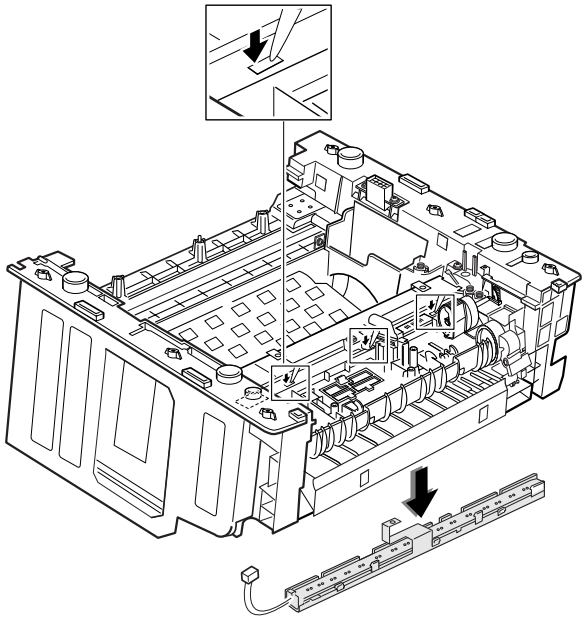
To remove the transfer guide :

Remove four screws and take the guide out.



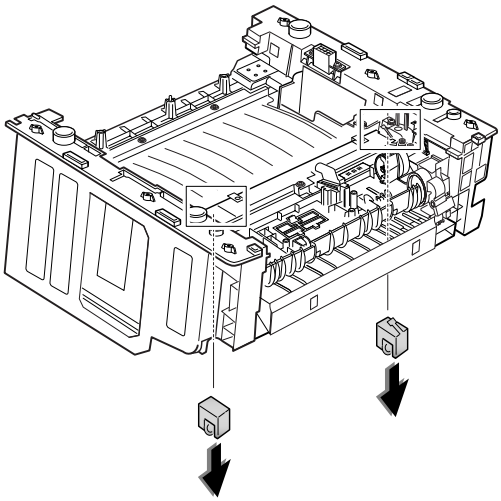
To replace the PTL module :

Release the three tabs latching the sensor using a phillips screwdriver, then push the sensor down.



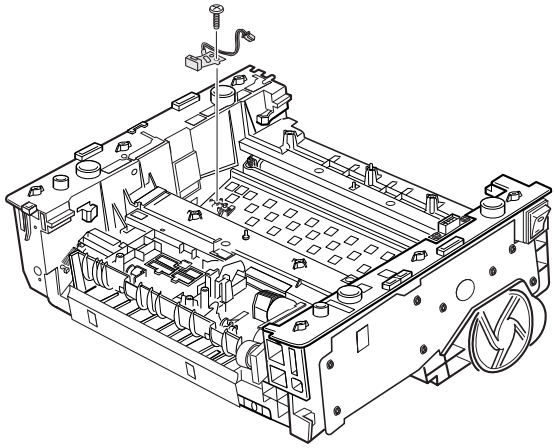
To replace the transfer roller bushings (left and right) :

Release each tab latching the left and right holder, then push the holder down.

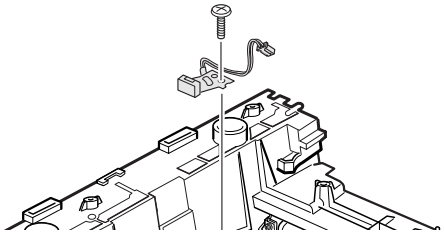


To replace the thermistor assembly :

Remove one screw, and remove the thermistor assembly.

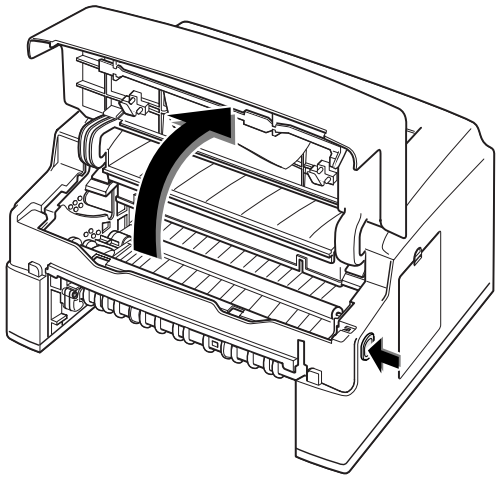


Note: When you reassemble the thermistor assembly, make sure that it puts in place.

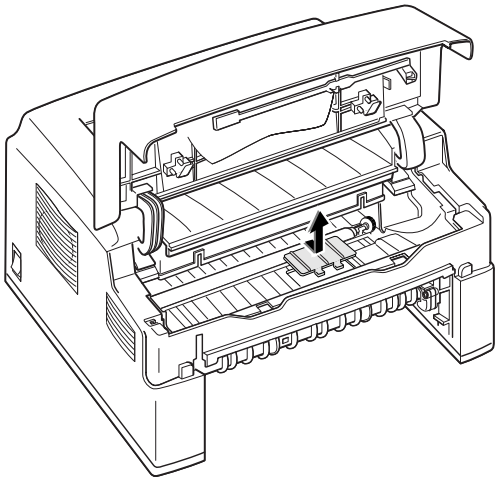


4-12. ROM

1. Press the cover open switch and raise the printer cover.

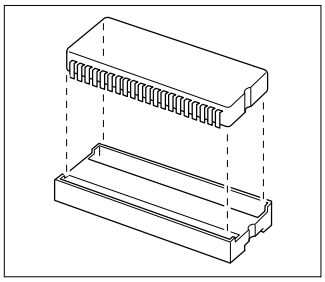


2. Remove the ROM cover.



3. Replace ROM using the specified jig.

Note: When you install a new ROM, be careful for the direction.



Memo

5. Troubleshooting

Error code 1-010

Fault	**Black vertical stripes**	Model	ML-xxxx

Description

Black vertical stripes occur in the printing.

Check

1. Developer cartridge
2. Transfer roller
3. Charge roller

Cause

1. Defective develop roller or bad blade of toner cartridge.
2. Defective transfer roller or charge roller.

Solution

1. Replace the toner cartridge, if defective.
2. Replace the roller defective.

Remark

Others

Error code 1-020

Fault	**White vertical stripes**	Model	ML-xxxx

Description

White vertical voids in the image.

Check

1. LSU
2. Developer cartridge
3. Fuser

Cause

1. Foreign matter stuck onto the window of internal lens of LSU mirror
2. Foreign matter or toner particles between the developer roller and blade
3. If the fuser is defective, voids occur periodically at the top of a black image.

Solution

1. Clean the LSU window with a recommended cleaner, or replace the LSU window.
2. Replace the developer cartridge if defective.
3. Open rear cover and check ribs in the fuser for contamination. Clean if necessary.

Remark

Use LSU cleaner dated after January 1997.

Others

If white streaks occurs fewer than 5 or 6 times, it can be considered as normal.

Error code 1-030

Fault	**Black horizontal stripes**	Model	ML-xxxx

Description

Dark or blurry horizontal stripes occur in the printing periodically.

Check

Developer cartridge

Cause

1. Bad contacts of the voltage terminals to developer
2. The rollers may be stained with toner particles.
   * Abnormal image periodicity :
     37.7 mm = Charge roller
     31.3 mm = Supply roller
     94.2 mm = OPC drum
     46 mm = Develop roller
     non periodical = Blade

Solution

1. Check all voltages, and adjust as necessary.
2. Check for terminal contacts, and replace the cartridge, if necessary.

Remark

Others

Error code 1-040

Fault	**Black or white spots**	Model	ML-xxxx

Description

Dark or blurry black or white spots occur periodically.

Check

1. Developer cartridge
2. Transfer voltage
3. Transfer roller's life

Cause

1. If dark or blurry black spots occur periodically, the rollers in the Developer may be contaminated with foreign matter or paper particles.
   (Charge roller : 37 mm interval, OPC drum : 94 mm interval).
2. If faded areas or voids occur in a black image at intervals of 94 mm, or black spots occur elsewhere, the OPC drum surface is damaged.
3. If a black image is partially broken, the transfer voltage is abnormal or the transfer roller's life has expired.

Solution

1. Run OPC cleaning to remove excess toner and paper particles on the charge roller and OPC drum. Repeat 2 or 3 times. Run the self-test. If the same problem persists, replace the developer.
2. Clean the rollers. If problem persists, replace the Developer.
3. The transfer roller guarantees 50,000 sheets printing. If the roller's life is expired, replace it.

Remark

Others

Error code 1-050

Fault	**Light image (1)**	Model	ML-xxxx

Description

The printed image is light, with no ghost.

Check

Developer cartridge

Cause

1. The life of cartridge is ended.
2. Ambient temperature is below than 10 °C.
3. Agitator gear in the Developer is defective.
4. Bad contact of supply roller and abnormal supply voltage.

Solution

1. Check the weight of the developer cartridge, and replace if necessary. When the cartridge is almost used up, the weight will be as follows:
   ML+6000D5 : 960 grams +/- 20 grams
2. In low temperature, wait 30 minutes after printer is powered on before you start printing.
3. Check if the hopper gear is visible from the side of the developer. If not, replace the developer.
4. Check for the supply roller contact and the supply voltage.

Remark

Others

Error code 1-051

Fault	**Light image (2)**	Model	ML-xxxx

Description

The printed image is light, with no ghost.

Check

Engine board

Cause

1. Charge voltage (=MHV) on the engine board exceeds 1520V. (Perform DCU diagnostic mode 01 to measure the voltage).
2. No power to the supply roller.

Solution

Check the following parts and replace if defective :
U201(KA324), Q211(C1008), T202(Transformer),
resistors, and diodes in the output and feedback area.

Remark

Check the charge voltage (MHV) at :
U201; while operating, #10/#9 2.5~2.9V, #8 5.5~8.5V
while idling, #9 2.7V, #10/#8 0V
Q201 operating voltage; Base 2~2.5V, Emitter 0~1V, Collector 30~60V
U203; #1 0V input, #2 0V output

Others

Error code 1-052

Fault	**Light image (3)**	Model	ML-xxxx

Description

The printed image is light, with no ghost.

Check

1. Engine board
2. Main body

Cause

1. Engine board bias (350-485V) and supply voltage (570-630V) may be low (Perform DCU diagnostic mode 04 to measure the voltage).
2. Direct strong light may be entered into the manual feed slot.

Solution

1. Check the following parts :
   U201(KA324), Q204(D526-Y), T204(Transformer), U203(SN7407N), resistors, diodes in the output and feedback area.
2. Check if contrast mode is set to ‘Light’. If not, change the install position of the printer or attach OPC cover sheet (P/No: JC72-49093A).

Remark

Bias and supply voltage check point:
U203; #9 pulse input, #8 pulse output

Others

Error code 1-060

Fault	**Dark image (1)**	Model	ML-xxxx

Description

The printed image is dark.

Check

Engine board

Cause

1. No charge voltage in the engine board. (Perform DCU diagnostic code ‘01’ to measure the voltage).

Solution

1-1. Check the following parts :
U201(KA324), Q211(C1008), Q201(D526-Y), T202, U203 (SN7407N),
resistors, diodes in the output and feedback area.

1-2. Clean the high voltage terminal on the engine and its PBA.

1-3. Refer to the following information.
U201(KA324)’s pin #12, #13 ; 2.5~2.9 V, pin #14 ; 5.5~8.5 V
For standby, pin #13 ; 2.7V, pin #12 & #14 ; 0V
Q201’s operating voltage ; base=+2~2.5 V, emitter=0~1 V collector=30~60 V
U203(7407N)’s pin #1 ; 0V input, pin #2 ; 0V output

Remark

Others

Error code 1-061

Fault	**Dark image (2)**	Model	ML-xxxx

Description

The printed image is dark.

Check

Engine board

Cause

1. No supply or bias voltage at the engine board
   (Perform DCU diagnostic code ‘04’ to measure the voltage).

Solution

1-1. Check the following parts :
U201(KA324), Q204(D526-Y), T204, U203 (SN7407N),
resistors, diodes in the output and feedback area.

1-2. Refer to the following information.
U203(7407N)’s pin #1; pulse input, pin #2; pulse output.

Remark

Others

Error code 1-062

Fault	**Dark image (3)**	Model	ML-xxxx

Description

The printed image is dark.

Check

Engine board

Cause

1. Voltage higher than normal. (normal supply voltage : 570-630V, normal bias voltage : 350-485V).

Solution

1-1. Check the following parts :
U201(KA324), Q204(D526-Y), T204, U203 (SN7407N)
resistors, diodes in the output and feedback area.

1-2. Refer to the following information.
U203(7407N)'s pin #9; pulse input, pin #8; pulse output.

1-3. Check developer contacts for contamination by toner particles.

Remark

Others

Error code 1-070

Fault	**Uneven density**	Model	ML-xxxx

Description

Print density is uneven between left and right.

Check

1. Transfer roller pressure
2. Developer cartridge

Cause

1. The pressure force on the left and right springs of the transfer roller is not even (left : 450 gf, right : 600 gf), the springs are damaged, the transfer roller is improperly installed, or the transfer roller bushing or holder is damaged.
2. The toner level is not even on the developer roller due to the bad blade.

Solution

1. Replace defective holder or springs. Adjust the transfer voltage.
2. Replace the developer cartridge.

Remark

Others

Error code 1-080

Fault	**Background**	Model	ML-xxxx

Description

Background appears in the printing.

Check

1. Engine board
2. Developer cartridge
3. Transfer roller
4. Operating environment

Cause

1-1. Low transfer voltage (10% below than normal)
1-2. High supply and / or bias voltage.
1-3. No transfer voltage.
2. Unauthorized recording paper has been used.
3. Abnormal ambient temperature or humidity.
4. Defective develop roller.

Solution

1-1. Refer to Error Code 1-060.
1-2. Refer to Error Code 1-061.
1-3. Refer to Error Codes 1-090 and 1-091.
2. Use a recommended type of recording paper.
3. If the printer is under abnormal ambient condition for a long time, print errors may occur. Improve the operating environment.
4. Replace the toner cartridge.

Remark

Others

Error code 1-090

Fault	**Ghost (1)**	Model	ML-xxxx

Description

Ghost occurs at 94 mm intervals.

Check

1. Developer cartridge
2. Main body

Cause

1. Contamination of high voltage terminals in the main body , engine board, and / or developer.
2. Transfer roller lifetime has expired.
3. No using recommended recording paper.
4. The Pre-Transfer Lamp (Refer to ⑱ on page 6-6.)

Solution

1. Open top cover and disassemble the unit and clean contamination components.
2. After replacing the transfer roller, make sure the transfer voltage is normal.
3. Use a recommended type of recording paper.
4. Check for the PTL operation, and if required, check for the main board.

Remark

Others

Error code 1-090-1

Fault	**Ghost (2)**	Model	ML-xxxx

Description

Ghost occurs at 94 mm intervals.

Check

Operating environment

Cause

1. Abnormal low temperature and humidity. In this case, ghost occurs on the entire page and the print density is too light.

Solution

1. If the operating temperature and relative humidity are too low, try waiting about 1 hour after power on before using printer.

Remark

Others

Error code 1-091

Fault	**Ghost (3)**	Model	ML-xxxx

Description

When xerographic paper is used in ADF, ghost occurs at 94 mm intervals.

Check

Engine board

Cause

1. No minus (-) transfer voltage output from the engine board.
   (Normal voltage : 1250 -1450V with 660 Mohm load)

2. The (+) transfer voltage may be abnormal when performing DCU #13 with 660 Mohm load on the transfer voltage output. (Normal voltage: 2200V (+30/-30V) DCU #14, 3250-3350V DCU #13).

Solution

Check the following parts :
U201(KA324), Q207(A708), Q202(KSD526-Y), T201, U203 (SN7407),
resistors, or diodes in the output and feedback area.

Remark

Others

In case of no minus transfer output voltage, image quality may be poor, and background may occur in the printing.

Error code 1-093

Fault	**Ghost (4)**	Model	ML-xxxx

Description

When printing on card stock or transparencies using manual feeder, ghost occurs at 94 mm intervals.

Check

1. Selected paper type in the software application
2. Engine board

Cause

1. When printing on card stock or transparencies, higher transfer voltage is required. Select ‘Thick Mode’ on paper type menu from the software application.
2. Defective transfer voltage terminal in the engine board.

Solution

1. Select ‘Thick Mode’ on paper type menu from software application to print on card stock or transparencies.
2. If the transfer voltage in the engine board is out of specification, refer to Error Code 1-091

Remark

Others

Error code 1-094

Fault	**Ghost (5)**	Model	ML-xxxx

Description

Dark ghost occurs in printing at 69 mm intervals

Check

Fuser

Cause

The heat roller and pressure roller in the fuser are contaminated with toner or paper particles.

Solution

Open the rear cover and check if the heat roller is stained. If stained, disassemble the fuser and clean the rollers with soft cloth dampened with alcohol. If ghost still occurs, replace the fuser.

Remark

Others

Error code 1-095

Fault	**Ghost (6)**	Model	ML-xxxx

Description

White ghost occurs in the black image printing at 46 mm intervals.

Check

1. Developer cartridge

Cause

1. The life of the developer may be expired.
2. Abnormal transfer voltage or bad contact of the transfer roller

Solution

1. Measure the weight of the developer and replace if the weight is less than 960g +/-20g.
2. Check the supply voltage and adjust if necessary. Check for the contact.

Remark

Others

Error code 1-100

Fault	**Partial blank image**	Model	ML-xxxx

Description

Partially blank image appears either periodically or non-periodically.

Check

1. Transfer roller
2. Developer cartridge

Cause

1. The pressure force on the left and right transfer roller springs are not even, the springs are damaged, the transfer roller is improperly installed, or the transfer roller bushing or holder is damaged.
2. If a black image prints light or gradually light at intervals of 49 mm, the transfer roller is defective.
3. If there is a partial blank image on left and right side of the page:
   1) The life of the transfer roller has expired.
   2) Abnormal transfer voltage.
   3) The life of the developer has expired.

Solution

1. Replace the defective components.
2. Replace the transfer roller.

3-1. Replace the transfer roller.

3-2. Measure the transfer voltage. If the voltage is abnormal, disassemble the main board and clean the components stained with toner or paper particles.

3-3. Measure the weight of the developer. If the weight is less than 960 g ±20 g, replace the developer.

Remark

Others

Error code 1-110

Fault	**Stains on the face of page**	Model	ML-xxxx

Description

Background too dark on the face of printed page

Check

1. Developer cartridge
2. Main body

Cause

1. Toner leakage due to improperly sealed developer.
2. Transfer roller length is out of spec. (218 mm) or the roller is defective.
3. The inside of the unit is contaminated with toner or paper particles.

Solution

1. Clean the unit thoroughly. If problems still occurs, replace the developer.
2. If the roller is shorter than the recording paper or the roller is severely stained, replace the roller.
3. Clean the contaminated components.

Remark

Others

Error code 1-111

Fault	**Stains on back of page**	Model	ML-xxxx

Description

The back of the page is stained at 49 mm intervals

Check

Transfer roller

Cause

1. Transfer roller is contaminated.
2. Abnormal (+) (-) transfer voltage, or cleaning voltage.
3. Defective transfer roller

Solution

1. Clean the transfer roller thoroughly. Replace if contaminated severely.
2. Adjust the voltages.
3. Replace if necessary.

Remark

Others

Error code 1-120

Fault	**Blank page printout**	Model	ML-xxxx

Description

Blank page is printed.

Check

1. Bad ground contacts in OPC and/ or developer.
2. Seal tape on the cartridge

Cause

1. GND OPC is not well grounded.
2. Seal tape is not removed.
3. Low toner

Solution

1. Repair or replace the GND terminal.
2. Remove the seal tape.
3. Shake the toner cartridge and print. Or replace with new one.

Remark

Others

Error code 1-121

Fault	**Partial black image**	Model	ML-xxxx

Description

One or several blank pages are printed.

When the printer turns on, several blank pages print.

Check

Control board

Cause

Defective control board

Solution

1. Perform the engine self test using DCU. If blank page prints, the control board is defective. If the printer works normally, refer to next solution (2). If the control board is defective, check the connection on the control board, QP1700 pin 125, and 202.
2. If blank page is printed one time or continuously, check that the video controller oscillates properly at 47.7789 MHz. (lower than 0.75V, higher than 3.5V)
3. If blank pages prints continuously when the printer turns on, check the CPU works properly, and replace if defective.

Remark

Others

Error code 1-130

Fault	**Data error**	Model	ML-xxxx

Description

Incomplete or missing characters.

Check

Control board

Cause

1. Bad connections of port
2. Defective oscillators in the video controller.
3. Defective CPU in the video controller.

Solution

1. Check that the port and related parts are properly connected or soldered.
2. Check the oscillators (47.7789 MHz, 50MHz) on the video controller.
3. Replace the CPU on the video controller.

Remark

Others

Error code 1-140

Fault	**Poor fusing grade (1)**	Model	ML-xxxx

Description

When printing on xerographic paper from cassette, the printed image is diffused.

Check

Engine board

Cause

Defective the fuser (Heat lamp) control circuit in the engine board.

Solution

Refer to solution 2-1 under Error Code 3-011.

Remark

Others

Error code 1-141

Fault	**Poor fusing grade (2)**	Model	ML-xxxx

Description

When printing on card stock or transparencies using manual feeder, the printed image is diffused.

Check

1. Improper paper type menu setup
2. Engine board

Cause

1. When printing on card stock or transparencies, higher transfer voltage is required.
2. Defective transfer voltage circuit in the engine board.

Solution

1-1. Select ‘Thick Mode’ on paper type menu from the software application to print on card stock or transparencies.

1-2. Check the fuser control circuit. Refer to Solution 2-1 under Error Code 3-011.

2. Check the transfer voltage and adjust if necessary.

Remark

Others

Error code 2-010

Fault	**Wrong print position**	Model	ML-xxxx

Description

Printing begins at wrong position on the paper.

Check

Feed sensor actuator, LSU, Pick-up ass'y, Bracket-dust, Solenoid, Video Controller.

Cause

1. Wrong sence time caused by defective feed sensor actuator.
2. Skew:
   - Bad LSU-assembling
   - Uneven pressure force of the pick-up ass'y
   - Defective mechanical parts
3. Top margin;
   - Early feeding by the solenoid
   - Wrong OP1 sensor position
   - Wrong video controller connection

Solution

1. Replace the defective actuator.
2. Reassemble or replace the LSU.
   Reassemble or replace the pick-up ass'y.
   Reassemble or replace the defective mechanical parts. (for example, Bracket-dust).
3. Replace the solenoid.
   Check OP1.
   Check the Vedio Controller or its connection.

Remark

Others

Error code 2-020

Fault	**Jam 0**	Model	ML-xxxx

Description

1. Paper is not exited from the cassette.
2. Paper is stopped just after cassette, before feed sensor, or on the feed sensor.

Check

Engine board

Cause

1. Open the printer cover, and close it. Then check :

1-1. If the paper does not feed into the printer, the feed clutch driving circuit in the engine board may be defective.

1-2. If the paper feeds into the printer and 'Jam 0' occurs, the feed sensor OP1 on the engine board may be defective.

2. Defective PLT-Knockup (12) (Refer to ⑨ on page 6-14.)

Solution

1. Check for the solenoid driving circuit using DCU diagnostic mode 06.
   1) Check for 24V input on D1 cathode. If 24V is not present, check Q4. If they work normally, check for 24V output from SMPS.
   2) Measure the feed clutch resistance. Replace if not approximately 60 ohms.
   3) Check Q4. if Q4 is OK, the collector and base should be 0V and 0.7V DC to GND, respectively.

2. Check for Feed sensor OP1 and related parts.
   1) Replace Feed sensor actuator if defective.
   2) When OP1 sensor is blocked, U6 (74HC245) pin#16 should be over 3.5V. When the sensor is not blocked, the pin should be below 0.7V.
      One side of R15 in OP1 transmitter should be 5V, and the other end 1.2V. If normal, check OP1 receiver. If not shorted, replace CPU.

3. Replace the cassette, if damaged.

Remark

Others

Error code 2-030

Fault	**Jam 1**	Model	ML-xxxx

Description

Recording paper is jammed in the output area (inside the fuser), or multiple sheets of the paper are fed at once.

Check

Engine board

Cause

1. Open the printer cover, and close it. Then check :
   - If the paper does not feed into the printer, the feed clutch driving circuit in the engine board may be defective.
   - If the paper feeds into the printer and ‘Jam 1’ occurs, the feed sensor OP1 on the engine board may be defective.
   - If paper is stopped in just front of fuser:

1-1. Feed sensor OP1 or feed actuator may be defective.

1-2. Exit sensor OP3 or exit actuator may be defective.

2. In case of multi-feeding, refer to Error Code 2-050.

Solution

1-1. Check the feed sensor OP1. Refer to Error Code 2-020. Replace the feed actuator if defective.

1-2. Check OP contacts. In operating mode, U6 (74HC245) pin#13 should be below 0.7V. If not, check OP3 contact resistance. Replace OP3 if over 100 ohms. If the switch works normally, check R30. If defective, replace the exit sensor actuator.

2. In case of multi feeding, refer to Error Code 2-050.

Remark

Others

Error code 2-040

Fault	**Jam 2**	Model	ML-xxxx

Description

Paper is completely fed out of the printer, but Jam 2 occurs. Or, the paper is stuck in the fuser roller.

Check

1. Engine board
2. Fuser

Cause

1. Check if paper is jammed in the pressure roller.
2. Open the printer cover, and close it :
   If Jam 2 occurs after the paper is completely fed out of the printer, the exit sensor contact may be bad or the exit sensor actuator may be deformed.

Solution

1-1. Check if the exit sensor actuator is defective, and replace if required.

1-2. Check the exit sensor OP3 contact and related parts. Refer to Error Code 2-030.

2. If the paper is stuck in the fuser, disassemble the fuser and remove the jammed paper, and clean the surface of the pressure roller with soft cloth, dampened with alcohol.

Remark

Others

Error code 2-050

Fault	**Multi-feeding**	Model	ML-xxxx

Description

Multiple sheets of paper are fed at once.

Check

Engine board

Cause

1. Solenoid malfunction.
2. Feed clutch armature does not engage the pick-up housing in the pick-up ass'y.

Solution

1. If the solenoid does not work properly:
   1-1. Measure the resistance of the feed clutch coil. If below 40 ohm (normal: 55-60 ohm), replace.
   1-2. Check Q4 C/E short, and replace as necessary. (If C and E are shorted, multiple sheets of paper feed when the printer powers on.)
   1-3. Check if the solenoid spring is returned to the original state. Replace if the return force is weak.
2. If the clutch works properly, but the armature does not engage the pick-up housing in the pick-up ass'y, bend the armature to pick up properly.

Remark

The feed clutch spring has 40 turns. A pad is attached to solenoid yoke, the armature angle is 90 degrees.

Others

Error code 3-010

Fault	**Fuser Error**	Model	ML-xxxx

Description

All the lamps on the operator panel blink and the system stops.

Check

1. Fuser
2. Engine board

Cause

1-1. Thermostat, AC wire, or heat lamp may be open.

1-2. Thermistor may be open. (DCU error code 60, 62, 68.)

2-1. Abnormal heat lamp on/off

2-2. Malfunction of the overheat circuit

Solution

1-1. Check thermostat, AC wire, and heat lamp. If the thermostat is open, check also R37, R47, or Q8.

1-2. If thermistor is open, check the wire. If the wire is good, check Q8. Q8 collector should be 0.2V, base 0.7V.

2-1. Check Q3 and its related parts in the order shown below.

1) Check Q3 C-E, B-E, B-C, and replace if shorted. If the voltage between B and E is below 0.7V, replace the transistor.

2) When lamp is on, if the base is 0V, check CPU pin 38.

3) When lamp is on, if the collector is 0V with lamp off, check PC151, Q101, and its related parts.

2-2. Check the overheat circuit. When U5 pin 7 is below 0.5V, the overheat circuit should activate and the lamp turns off. In normal mode, pin 6 is approximately 2.6V, pin 5 is over 2.6V, and pin 7 is over 4V. If not, check all related parts.

Remark

Others

Error code 3-011

Fault	**Malfunction of the gear motor in the fuser**	Model	ML-xxxx

Description

When printing, motor breaks away from its place due to the defective fuser gear.

Check

1. Fuser
2. Engine board

Cause

1. Fuser control temperature is set too high.
2. PC151 or Q3 is defective.
3. Overheat circuit is not operating properly.

Solution

1-1. Check if the thermostat is open, and replace.

1-2. Check if the thermistor sensor is in place, and replace if required.

2-1. R57 and R58 = 3.3k and 1k, respectively.
Check if R57 and R58 are 3.3K and 1K respectively.

2-2. Replace Q3 if C and E are short.

2-3. Replace PC151 if pin 4 and 6 are short.

2-4. Replace Q101 if T1 and T2 are short.

3. Check if the overheat circuit works properly :
Refer to the solution 2-2 under ‘Error Code 3-010’.

Remark

Others

Error code 3-020

Fault	**Scanner Error**	Model	ML-xxxx

Description

The feeding paper is stopped in the front of transfer roller and all lamps on the operator panel blink.

Check

1. LSU
2. Engine board

Cause

1. Defective LSU
2. Defective Q5, or CPU
3. Abnormal resistance value of R8, R62

Solution

1. Perform DCU diagnostic code 05. If the DCU error code 95 is displayed, replace LSU.
   If you cannot solve the problem after you replace LSU, follow the steps below.

   (1) When you press ENTER key with DCU code ‘05’, if the LSU motor does not run, check U205 pin 5, pin 6. If U205 pin 5, and pin 6 are normal, check CPU pin 40 and the related parts. If the motor drives properly, and CPU pin 25 is not below 0.5V, replace R51 and CPU.

   (2) When you press UP key with DCU code ‘05’, if ON and OFF lamps do not turn on, check CPU pin 28 and 41, and their related parts. Normally pin 28 is over 3.5V when high, and below 0.7V when low. If the transformer works normally, replace CPU.

Remark

Others

Q3, U3, CN3, SW151

Error code 3-030

Fault	**Paper Empty**	Model	ML-xxxx

Description

- The PAPER lamp on the operator panel is on even when paper is loaded in the cassette.
- The PAPER lamp on the operator panel does not come on when the paper cassette is empty.

Check

1. Actuator-Empty (Refer to ⑤② on page 6-6.)
2. Engine board

Cause

1. Empty actuator may be defective.
2. Photo sensor OP2 on the engine board may be defective.

Solution

1. Replace the defective actuator.

2-1. U6 (74HC245) pin 15 should be over 3.5V when OP2 sensor is blocked, and below 0.7V when the sensor is not blocked.

2-2. One end of R24 in the transmitter of OP2 should be 5V, and the other end 1.2V.

2-3. If the related resistors are good, check for short circuit of OP2 receiver. If OP2 is normal, replace U6 (74HC245).

Remark

Others

Error code 3-040 / 3-041

Fault	**Cover Open**	Model	ML-xxxx

Description

- The ERROR lamp is on even when the printer cover is closed.
- The ERROR lamp does not come on even when the printer cover is open.

Check

1. Hook lever in the top cover (Refer to ② on page 6-4.)
2. Engine board
3. Actuator-cover open (Refer to ㊽ ㊾ on page 6-6.)

Cause

1. The hook lever may be defective.
2. Malfunction of the circuit containing the micro switch SW151 and its related parts on the engine board.
3. Defective actuator-cover open.

Solution

1. Replace the hook lever, if defective.

2. Check SW151 and its related parts :

2-1. Check SMPS 24V output.

2-2. Check D4 anode when SW151 is pressed. D4 anode will be below 3.5V when SW151 is open. Check for R38 and R39, and replace if defective.

2-3. If D4 anode is over 3.5V, check if CPU pin 48 is short. If not, replace CPU.

3. Replace the defective actuator.

Remark

Others

Error code 3-050

Fault	**All Lamps Blinking**	Model	ML-xxxx

Description

When printer power is on, all lamps on the operator panel blink.

Check

1. Harness between the engine and control boards
2. Engine board

Cause

Defective interface between the engine board and control boards (DCU error code ‘78’)

Solution

1. Check the harness between the engine and control boards.

2-1. Check if the engine board works properly when the printer resets. U5 pin 1 should be below 0.7V for about 122 ms after power is on, then remain over 3.5V.
-Check U5 pin 2 = approx. 3.8V. If so, check R54 or R55.
-Check U5 pin 3 = approx 4V. If so, check R53 or R56, or C35.
-If the voltages are normal, and U5 pin 1 is below 0.7V, replace U5.
-If all are normal, check CPU pin 55. If OK, replace CPU.

2-2. Check for X1 oscillation (6.94407MHz).

2-3. Replace EPROM in the engine board, if defective.

2-4. If all above are OK, replace CPU.

Remark

Others

U4, U202, Q9

Error code 3-060

Fault	**Memory Overflow**	Model	ML-xxxx

Description

When printing, error message is printed out.

Check

Control board

Cause

Insufficient printer memory.

Solution

Install optional SIMM memory in the control board.

Remark

Others

Error code 3-080

Fault	**Defective motor operation**	Model	ML-xxxx

Description

Main motor is not driving when printing, and paper does not feed into the printer, resulting ‘Jam 0’.

Check

1. Engine board
2. Sub motor board (Refer to (12) on page 6-6.)

Cause

1. Motor harness or CN104 may be defective.
2. U1 defective in the sub motor board.

Solution

1. Check the motor harness. replace it, if defective.

2-1. Perform DCU diagnostic code 00 and check the motor operation.

2-2. With DCU code ‘00’, check for pulse at U1 pin 8 and pin 13. Or, check the related parts.

2-3. With DCU code ‘00’, check U1 pin 4 and pin 17 are over 4V. If the pins are below 1V, check R424.

2-4. If all above are OK, replace U1.

Remark

Others

Error code 3-090

Fault	**Ear-splitting noise or allophone**	Model	ML-xxxx

Description

While operating, ear-splitting noise occurs.

Check

LSU motor, Main motor bracket, Fan, Developer, Fuser gear

Cause

1. Defective LSU motor and main motor bracket, or defective harness

2. Foreign materials in the fuser gear or developer

Solution

1-1. Replace the LSU, if defective.

1-2. Check the main motor bracket or its wiring harness.

1-3. Check pick-up ass'y rolls.

2. Reassemble or replace the fuser and developer if defective.

Remark

Others

Error code 3-100

Fault	**No power**	Model	ML-xxxx

Description

When system power is turned on, all lamps on the operator panel do not come on.

Check

Engine board

Cause

1. Defective harness between engine and control boards.
2. Defective harness between the control board and panel.
3. Defective fuse F151
4. Defective fuse F101
5. BD101 short. Check for the resistance value of Q102.
6. Defective U101

Solution

1. Check the connection between engine and control boards, and replace, if defective.
2. Check the connection between control board and operator panel. If defective, replace the harness.
3. Check F151 on the engine board. If open, measure the resistance between 5V and ground. If it is below 50 ohm, it is short.
4. Check F101 on the engine board. If open, check also :
   - R114 open
   - Q102, D-S, G-D, or G-S short
   - Defective BD101

Remark

Others

Error code 3-110

Fault	**Vertical line getting curved**	Model	ML-xxxx

Description

When printing, vertical line gets curved.

Check

LSU
Engine board

Cause

1. For LSU, +24V supply is unstable in the engine board.
2. Difference according to LSU vendors

Solution

- Check the capacitor between CN 3 pin 5 and +24V is 100nF.
- Check the resistor R63 (12.1Kohm).
- Replace LSU.
- Replace the main board.

Remark

Others

Fault	**All LEDs On**	Model	ML-xxxx

Description

When turning on, all LEDs are continuously on.

Check

Fuser, LSU, Engine board

Cause

1. Fuser error
2. LSU error
3. Bad connection between engine board and control board.

Solution

1. Replace the fuser.
2. Replace the LSU.
3. Check the wiring between the engine board and the control board.
4. Replace engine board.

Remark

Others

Fault	**Jitter**	Model	ML-xxxx

Description

When printing, image is irregular.

Check

LSU, Motor bracket

Cause

1. LSU hexahedron period
2. Defective motor bracket gears

Solution

1. Replace the LSU.
2. Replace the motor bracket ass'y.

Remark

Others

6. Exploded Views and Parts Lists

6-1. Main Exploded View

6-2. Cover Exploded View

6-3. Frame Exploded View

6-4. Fuser Exploded View

6-5. Drive Assembly Exploded View

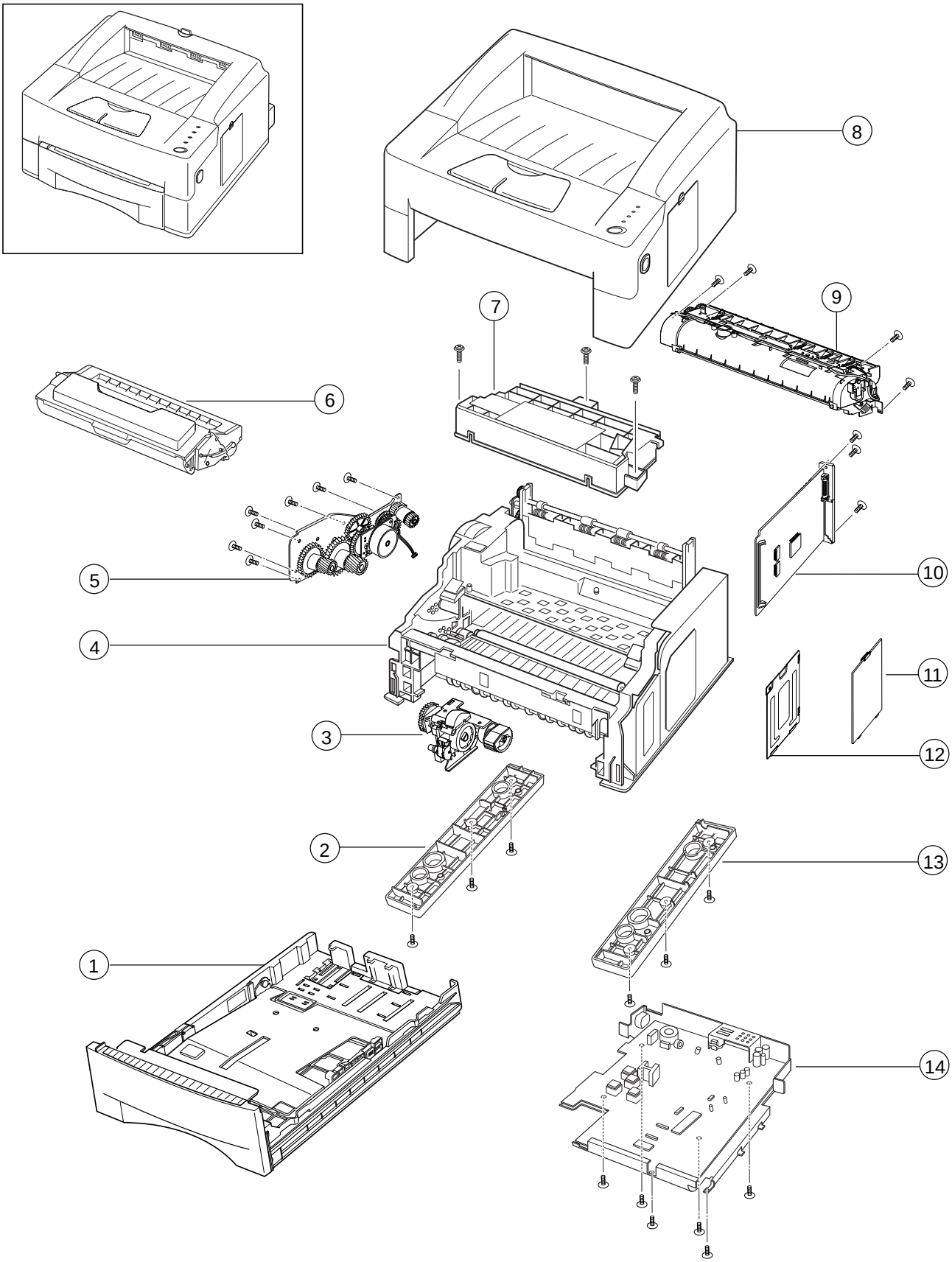
6-6. Pick-Up Exploded View

6-7. Cassette Exploded View

6-8. Second Cassette Exploded View (Option)

6-9. Second Cassette Frame Exploded View (Option)

6-1. Main Exploded View



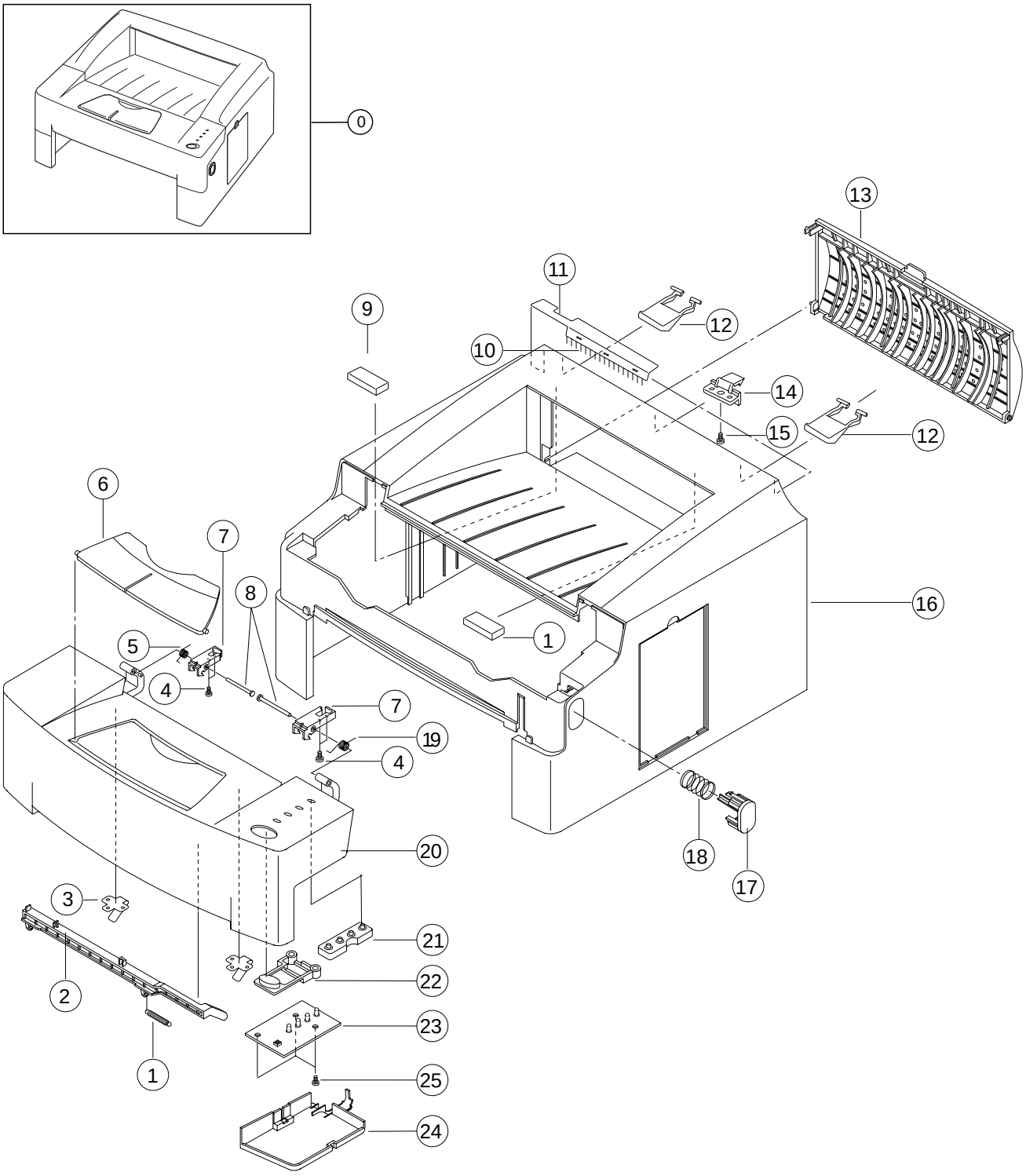
Main Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
1	MEA RACK-FEEDER CAS	JC97-01077A	1	O
2	MEC-BRKT, BASE R	JC75-10922A	1	O
3	MEA RACK-FEEDER.	JC97-01078A	1	O
4	ELA HOU-FRAME(12)	JC96-01092A	1	X
5	ELA HOU-MOTOR MAIN	JC96-01099A	1	O
6	ELA-DEVE UNIT	ML+6000D5	1	X
7	UNIT-LSU	JC59-10507A	1	O
8	ELA HOU-CVR_MAIN	JC96-01365A	1	O (220V)
		JC96-01364A	1	O (110V)
9	ELA HOU-FUSER_220,KR	JC96-01280A	1	O
10	ELA HOU-CONTROLLER_K	JC96-00982A	1	O (220V)
		JC96-00982B	1	O (110V)
11	PRO-COVER_SIMM	JC72-41224A	1	O
12	IPR-SHIELD SIMM	JC70-10234A	1	O
13	MEC-BRKT, BASE	JC75-10920B	1	O
14	ELA HOU-ENG B'D(220)	JC96-01228A	1	O (220V)
	ELA HOU-ENG B'D(110)	JC96-01236A	1	O (110V)

Note

- 110V : for QwikLaser 6050
- 220V : for ML-6050

6-2. Cover Exploded View



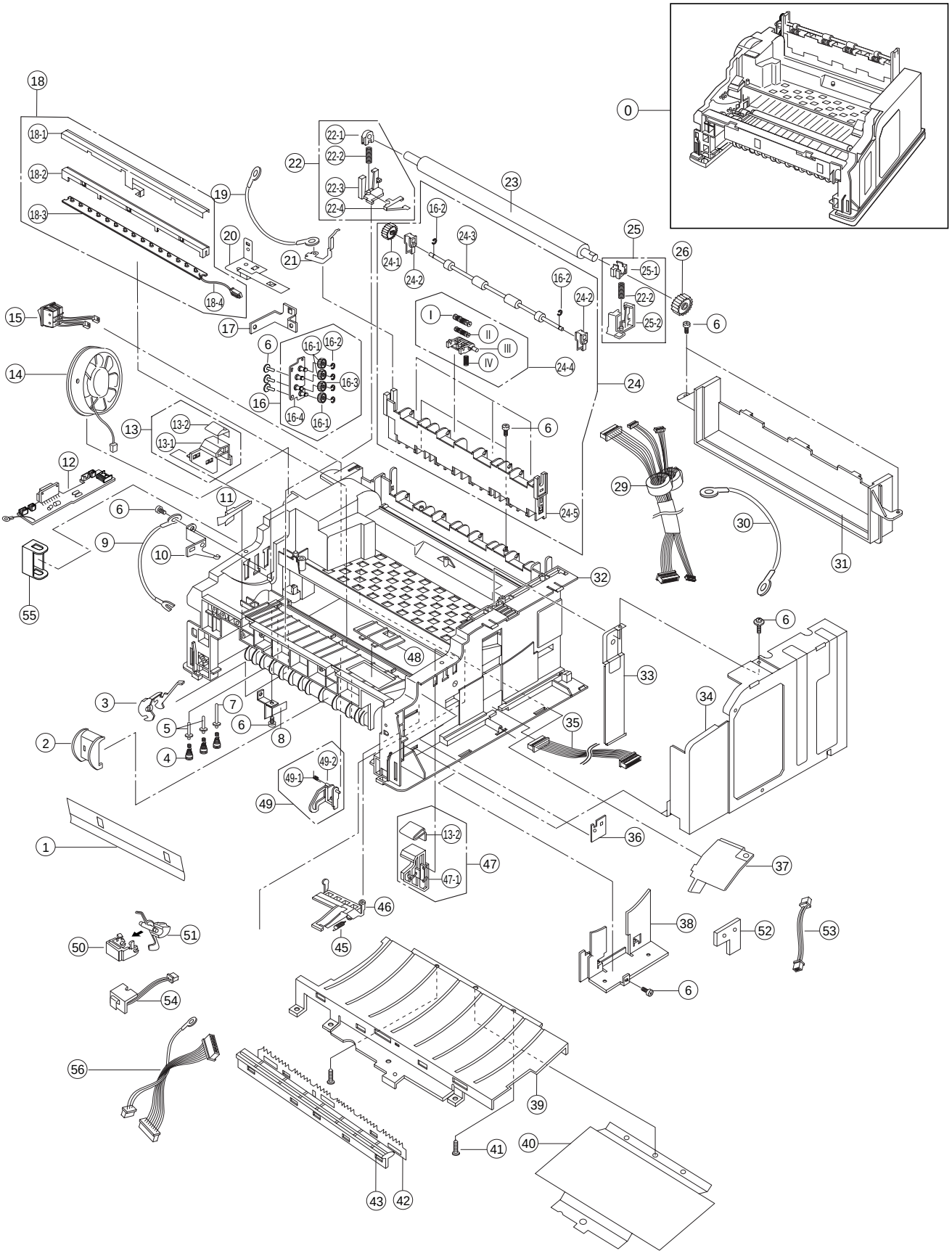
Cover Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	ELA HOU-CVR_MAIN	JC96-01365A	1	O (220V)
		JC96-01364A	1	O (110V)
1	SPRING-HOOK LEVER	6107-000133	1	X
2	LEVER-HOOK	JC72-40325A	1	X
3	PLATE-SPRING, DEV	JC70-10223A	2	X
4	SCREW-TAPTITE	6003-000002	4	X
5	SPRING-COVER OPEN, L	JC61-70944A	1	X
6	STACKER-SUB	JC72-41220A	1	X
7	HINGE-HSG, R	JC72-41216A	2	X
8	SHAFT-COVER OPEN	JC70-10228A	2	X
9	PAD-DUMMY	JC73-30912A	2	X
10	BRUSH-ANTI	JC74-40902A	1	X
11	GROUND-ANTI	JC70-11057A	1	X
12	GUIDE-DUMMY	JC72-41111A	2	X
13	COVER-EXIT	JC72-41221A	1	X
14	LOCKER-EXIT	JC72-41286A	1	X
15	SCREW-TAPTITE	6003-000196A	1	X
16	COVER-MAIN	JC72-41214A	1	X
17	BUTTON-C/O	JC72-40336D	1	X
18	SPRING-CS (BUTTON)	6107-000117	1	X
19	SPRING-COVER OPEN, R	JC61-70945A	1	X
20	COVER-FRONT, LED	JC72-41215F	1	X (220V)
	COVER-FRONT, XAR	JC72-41215E	1	X (110V)
21	WINDOW-LED	JC72-41397A	1	X
22	BUTTON-PANEL, LED	JC72-41219A	1	X
23	PBA-PANEL, LED	JC92-00346A	1	O
24	CAP-PANEL WIRE	JC72-41222A	1	X
25	SCREW-TAPTITE	6003-000002	3	X

Note

- 110V : for QwikLaser 6050
- 220V : for ML-6050

6-3. Frame Exploded View



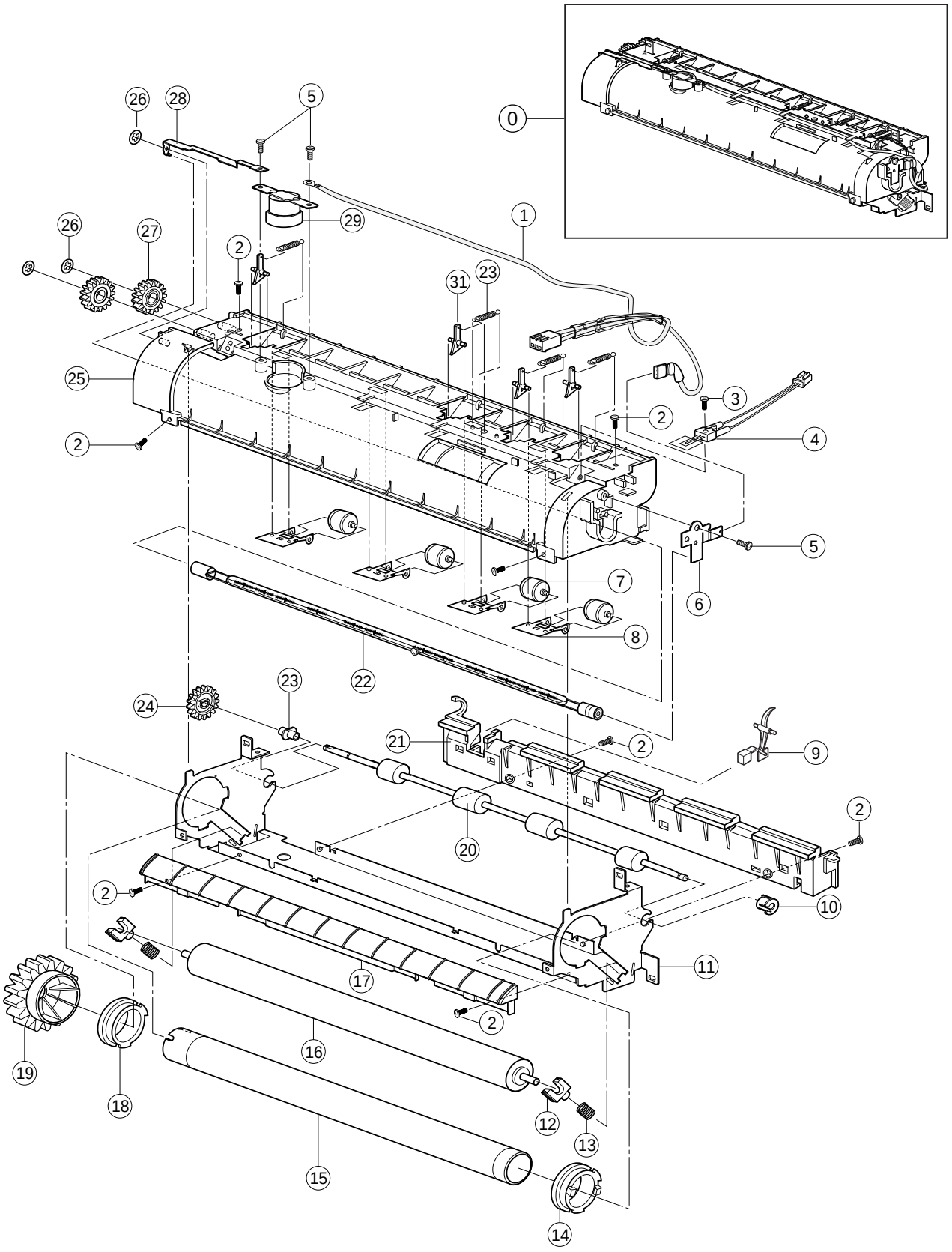
Frame Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	ELA HOU-FRAME (12)	JC96-01338B	1	X
1	SHEET COVER OPC	JC72-40909A	1	X
2	GUIDE-SKEW(12)	JC72-41350A	1	X
3	ACTUATOR-FEED(12)	JC72-00012A	1	X
4	SPRING-CS	6107-000104	3	X
5	CONNECTOR TERMINAL2	3712-000165	2	X
6	SCREW-TAPTITE 3*10	6003-000002	6	X
7	CONNECTOR TERMINAL1	3712-000166	1	X
8	GROUND-PLT MOTOR	JC70-10013A	1	X
9	CBF HARNESS	JC39-40576A	1	X
10	GROUND-OPC(12)	JC70-11070A	1	X
11	GUIDE-DUST	JC70-11068A	1	X
12	MOTOR BOARD	JC92-01045A	1	X
13	ELA-DEVELOPER, GUID	JC96-00290A	1	O
13-1	GUIDE-DEV L	JC72-40274A	1	X
13-2	SPRING-PS G/DEV	JC61-70001A	2	X
14	FAN DC 24V	3103-001049	1	X
15	SWITCH	JC39-00004A	1	X
16	MEA RACK-BRKT_EXIT	JC97-01198A	1	O
16-1	GEAR-EXIT/U ID	JC66-40006A	4	X
16-2	RING-C ID3	6044-000159	2	X
16-3	GEAR-EXIT, IDLE(Z17)	JC66-40964A	1	X
16-4	BRACKET_EXIT	JC70-11075A	1	X
17	EARTH PLATE FUSER	JC70-10911A	1	X
18	ELA HOU-PTL	JC96-01150A	1	O
18-1	EARTH TRNAS (12)	JC70-11023A	1	X
18-2	HOLDER-PTL	JC72-41187A	1	X
18-3	PBA MAIN PTL	JC92-01050A	1	X
18-4	CBF HARNESS	JC39-40543A	1	X
19	CBF HARNESS	JC39-40546A	1	X
20	GND PLATE G/TR	JC70-10980A	1	X
21	GROUND-EXIT	JC70-11058A	1	X
22	MEA RACK-TR HOLDER, L	JC97-01079A	1	O
22-1	BUSHING-TR12 (L)	JC72-41283A	1	X
22-2	SPRING-TR (12)	JC61-70940A	2	X
22-3	HOLDER-TR L (12)	JC72-41285A	1	X
22-4	SPRING-PLATE (12)	JC70-11050A	1	X
23	ROLLER-TRANSFER	JC75-10962A	1	O

Location No.	Description	SEC. Code	Q'ty	Remark
24	HEA RACK-HOU EXIT	JC97-01104A	1	O
24-1	GEAR-EXIT	JC66-40209A	1	X
24-2	BEARING-EXIT	JC75-10529A	2	X
24-3	ROLL EXIT FR/UP	JC75-10957A	1	X
24-4	MEA RACK-EXIT ROLLER	JC97-01098A	1	X
I	ROLLER EXIT MAIN	JC72-41081A	4	X
II	ROLLER EXIT FR	JC72-41082A	4	X
III	HOLDER-EXIT	JC72-41080A	4	X
IV	SPRING-CS	6107-000106	4	X
24-5	HOUSING-EXIT (250)	JC72-41114A	1	X
25	MEA RACK-TR HOLDER, R	JC97-01071A	1	O
25-1	BUSHING-TR12 (R)	JC72-41060A	1	X
25-2	HOLDER-TR R (12)	JC72-41062A	1	X
26	GEAR-TRANSFER (12)	JC66-40949A	1	O
29	LSU-HARNESS	JC39-40540A	1	X
30	CBF-HARNESS	JG39-40179A	1	X
31	GUIDE-FUSER	JC72-41223A	1	X
32	BASE FRAME	JC72-41113A	1	O
33	SHIELD CAP WIRE	JC70-10003A	1	X
34	SHIELD ICU	JC70-10225A	1	X
35	CBF HARNESS	JC39-40009A	1	X
36	FILM-EMI	JC74-10908A	1	X
37	DAMPER-PLATE	JC72-41288A	1	X
38	GROUND-ICU	JC70-10006A	1	X
39	GUIDE-TRANSFER	JC70-10220A	1	X
40	SHEET GUIDE-TR	JC74-10907A	1	X
41	SCREW-TAPTITE 3*8	6003-000119	2	X
42	PLATE-SAW	JC70-10232A	1	X
43	HOLDER-SAW PLATE	JC72-40247A	1	X
44	ELA HOU-THERMISTOR	JC96-01148A	1	X
45	SPRING-CVR OPEN (12)	JC61-70964A	1	X
46	ACTUATOR-C/O	JC72-40269A	1	X
47	ELA-DEVELOPER, GUID	JC96-00291A	1	O
47-1	GUIDE-DEV R	JC72-40275A	1	X
48	ROM COVER	JC72-41186A	1	X
49	MEA RACK-EMPTY_ACT	JC97-01207A	1	O
49-1	SPRING-EMPTY	JC61-70965A	1	X
49-2	ACTUATOR-EMPTY12	JC72-41290A	1	X
50	ACTUATOR-TR	JC72-41287A	1	O

Location No.	Description	SEC. Code	Q'ty	Remark
51	HOLDER-ACTUATOR	JC72-41289A	1	O
52	PBA MAIN-CLN	JC92-01084A	1	O
53	CBF-HARNESS	JC39-40513A	1	X
54	ELA-HOU CLEANING PLT	JC96-01229A	1	X
55	CAP-GND WIRE	JC72-00011A	1	X
56	CBF-HARNESS MOTOR	JC39-40575A	1	X

6-4. Fuser Exploded View



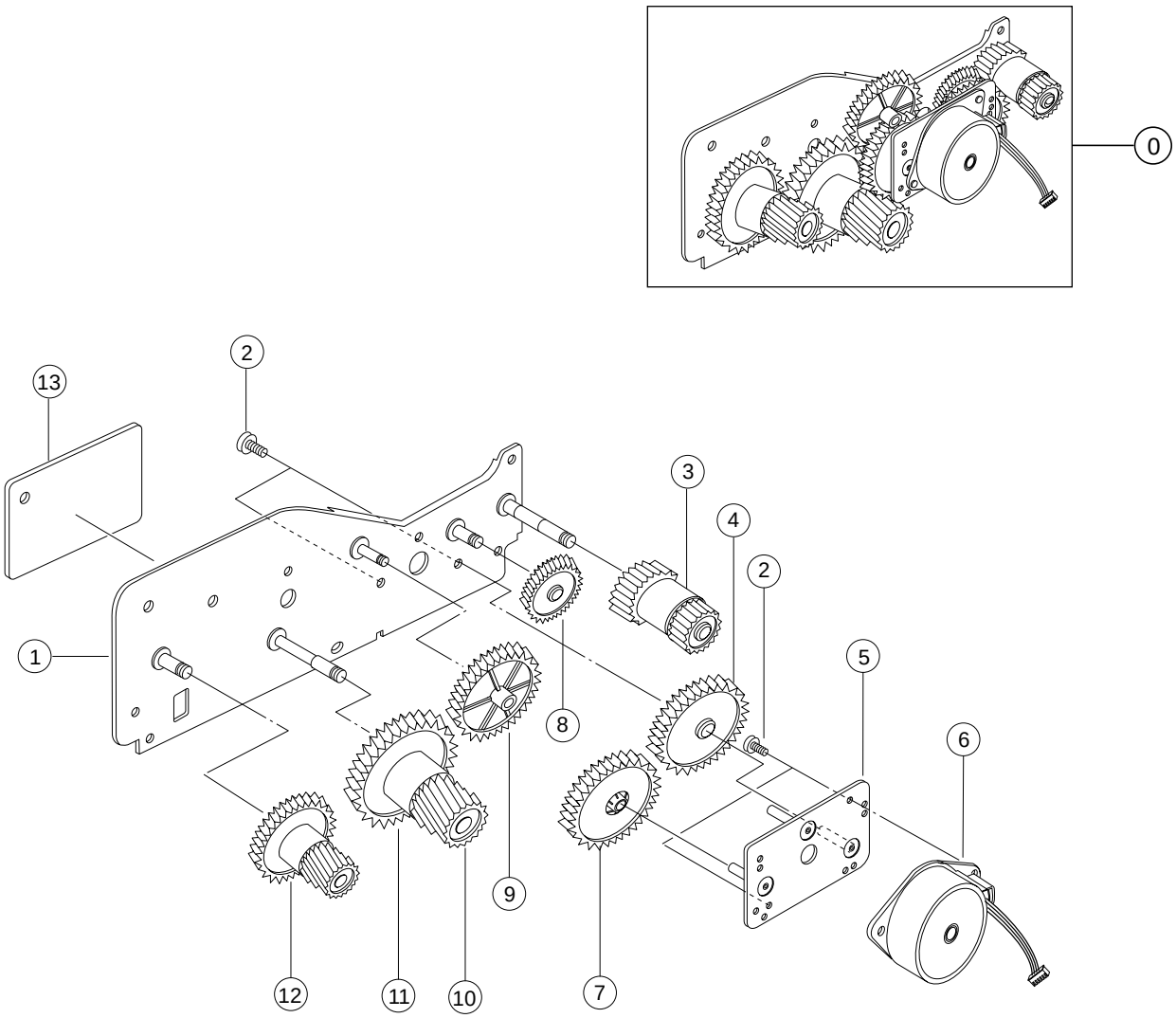
Fuser Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	ELA HOU-FUSER(110V)	JC96-01093A	1	O (110V)
	ELA HOU-FUSER(220V)	JC96-01094A	1	O (220V)
1	CBF-HARNESS-FU(110)	JC39-40609A	1	X
	CBF-HARNESS-FU(220)	JC39-40610A	1	X
2	SCREW-MACHINE M3x6, BH+	6001-000131	8	X
3	SCREW-TAPTITE M3x12, FH+	6003-000198	1	X
4	THERMISTOR-NTC	1404-001117	1	O
5	SCREW-TAPTITE M3x8, BH+	6003-000119	3	X
6	NPR-ELECTRODE FU R	JC71-10201A	1	X
7	PMO-ROLLER EXIT F/UP	JC72-40342A	4	X
8	SPRING-PS, EXIT F/UP	JC70-11067A	4	X
9	PMO-ACTUATOR EXIT	JC72-41079A	1	O
10	BEARING-EXIT FU	JC66-10201A	1	X
11	IPR-FUSER LOWER	JC70-10983A	1	X
12	PMO-BUSHING PR	JC72-41078A	2	X
13	SPRING-PR	JC61-70923A	2	X
14	PMO-BUSHING HR, R	JC72-41077A	1	X
15	NEX-ROLLER HEAT	JC71-20901A	1	O
16	MEC-ROLLER PRESSURE	JC75-10956A	1	O
17	PMO-GUIDE PATH	JC72-41074A	1	X
18	PMO-BUSHING HR, L	JC72-41076A	1	X
19	GEAR-FUSER	JC66-40926A	1	O
20	MEC-ROLLER EXIT, FU/LR	JC75-10955A	1	X
21	PMO-FUSER REAR	JC72-41075A	1	X
22	LAMP-HALOGEN	4713-001075	1	O (220V)
		4713-001076	1	O (110V)
23	BEARING-EXIT FU L	JC66-10200A	1	X
24	GEAR-EXIT	JC66-40209A	1	X
25	PMO-FUSER UPPER	JC72-41073A	1	X
26	RING-CS	6044-000001	3	X
27	GEAR-EXIT, L/ID	JC66-40964A	2	X
28	NPR-ELECTRODE FUSER	JC71-10902A	1	X
29	THERMOSTAT	4712-000001	1	O
30	PMO-CLAW SEPARATOR	JC72-41064A	4	X
31	SPRING-CLAW	JC61-70922A	4	X

Note

- 110V : for QwikLaser 6050
- 220V : for ML-6050

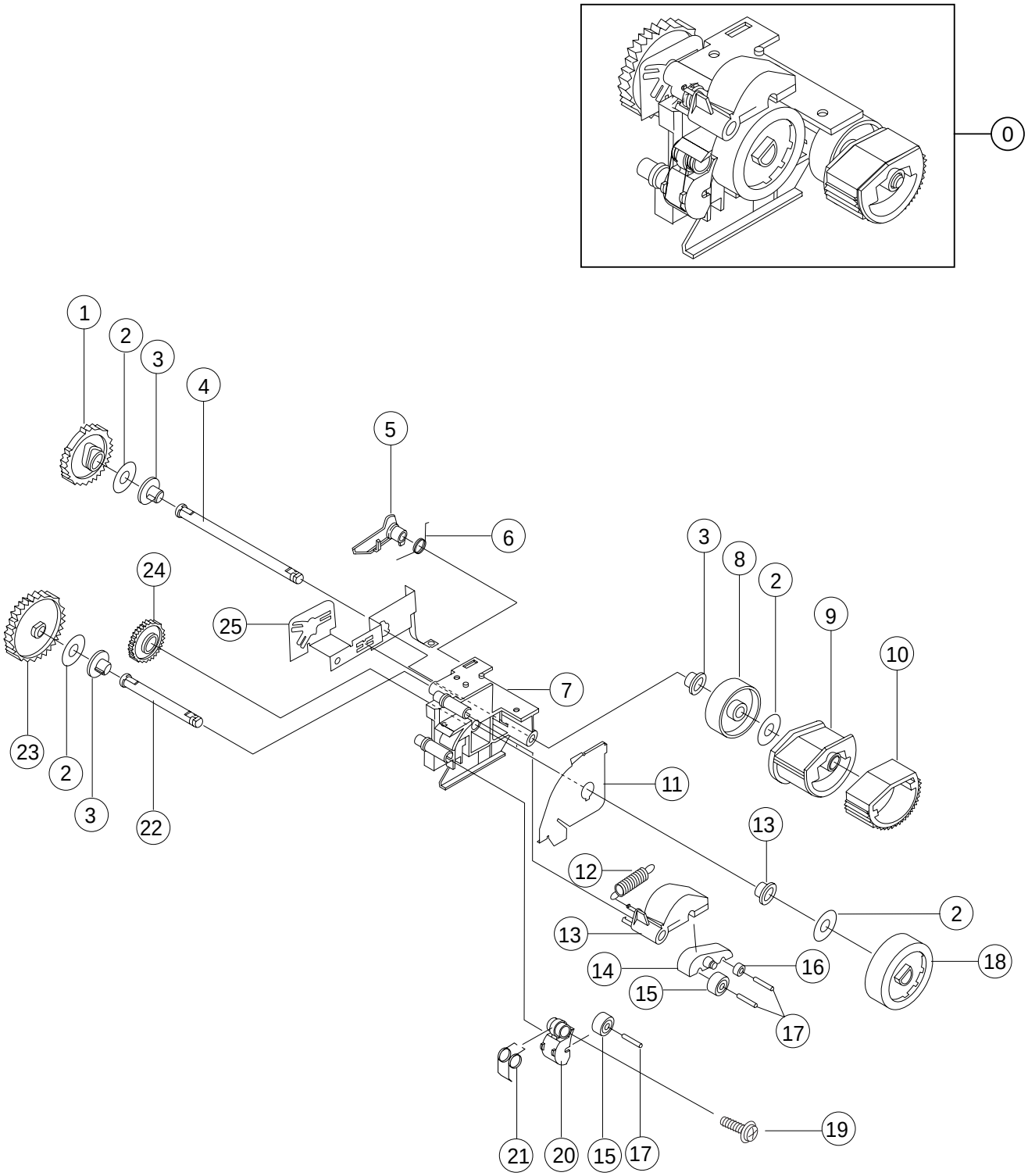
6-5. Motor Exploded View



Motor Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	ELA HOU-MOTOR MAIN	JC96-01099A	1	O
1	IPR-BRKT_GEAR	JC70-10984A	1	X
2	SCREW-MACHINE M3x6	6001-000131	5	X
3	GEAR-FUSER DRIVE	JC66-40378A	1	X
4	GEAR-125/18	JC66-40376A	1	X
5	IPR-BRKT, MOTOR	JC70-10985A	1	X
6	MOTOR-STEP	3101-001144	1	O
7	GEAR-132/50 (12)	JC66-40959A	1	X
8	GEAR-IDLE, FU	JC66-40377A	1	X
9	GEAR-IDLE OPC (12)	JC66-40960A	1	X
10	GEAR-OPC DRV2	JC66-40001A	1	X
11	GEAR-OPC DRIVE (12)	JC66-40961A	1	X
12	GEAR-FEED DRV (12)	JC66-40962A	1	X
13	FILM-BRACKET	JC73-00002A	1	X

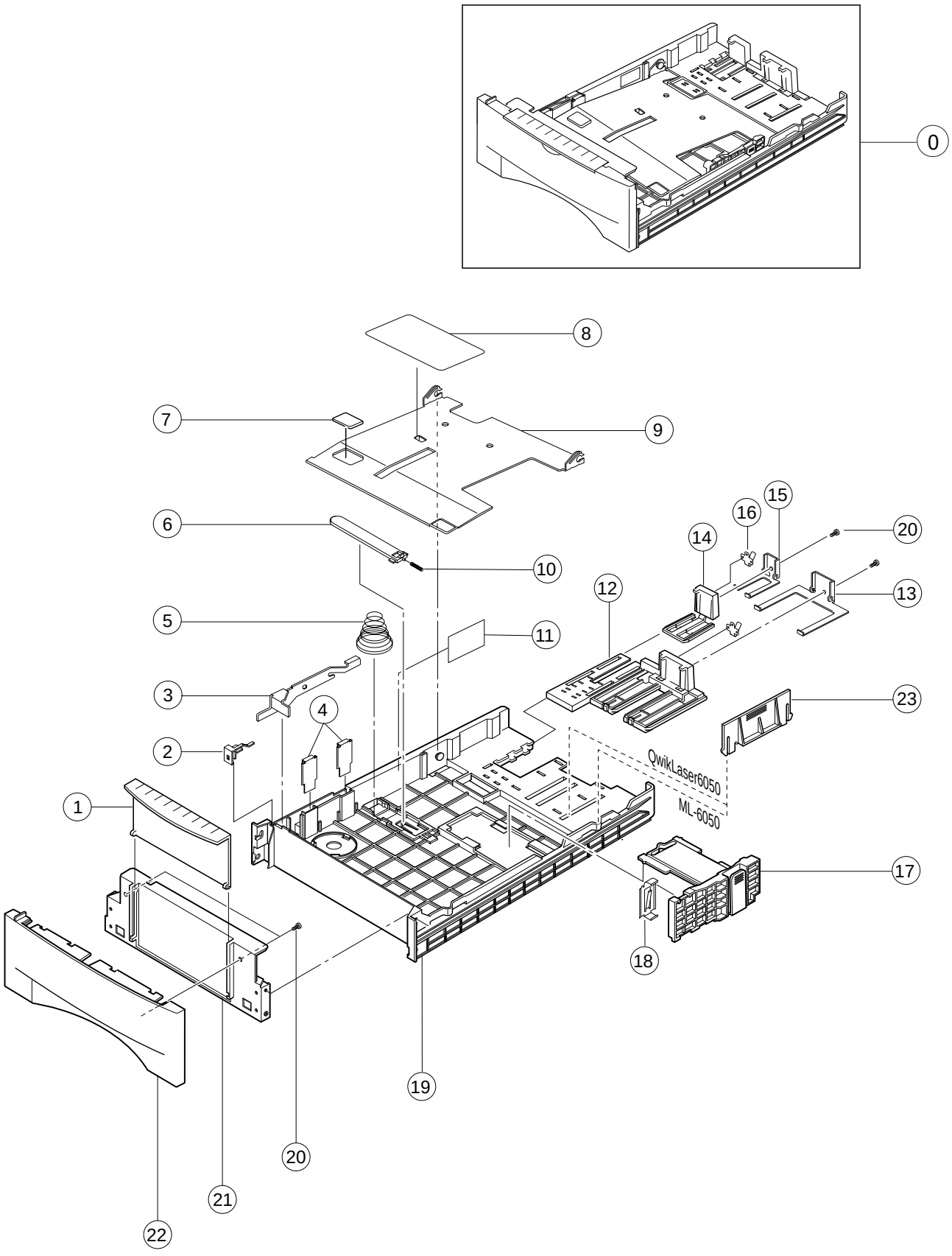
6-6. Pick-Up Exploded View



Pick-Up Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	MEA RACK-FEEDER	JC97-01078A	1	O
1	PLT, GEAR-PICK UP	JC66-40219A	1	X
2	WASHER-PLAIN	6031-000021	4	X
3	PLT, BEARING-PICK UP	JC66-10202A	4	X
4	IMP, SHAFT-PICK UP	JC70-10231A	1	X
5	PLT, LEVER-PICK UP	JC72-40254A	1	X
6	SPRING PICK-UP	JC61-70966A	1	X
7	PLT, FRAME-FEED	JC72-41115A	1	X
8	PMP, IDLE-PICKUP	JC72-41234A	1	X
9	PLT, HOUSING-PICK UP	JC72-40252A	1	X
10	PLT, RUBBER-PICKUP	JC73-40907A	1	X
11	IMP, GUIDE-FEED	JC70-10992A	1	X
12	SPRING-FEED (2)	JC61-70942A	1	X
13	PLT, HOLDER-FEED2	JC72-41185A	1	X
14	PLT, SUB HOLER-FEED, SMALL	JC72-40266A	1	X
15	PLT, ROLLER-FEED, LARGE	JC72-40261A	2	X
16	PLT, ROLLER-FEED, SMALL	JC72-40262A	1	X
17	IMP, SHAFT-FEED, IDLER	JC70-10230A	3	X
18	PLT, ROLLER-FEED, DRIVE	JC72-41295A	1	X
19	SCREW (M3X6 FH+, BLK)	6003-000002	1	X
20	PLT, HOLDER-FEED1	JC72-41184A	1	X
21	SPRING-FEED (1)	JC61-70941A	1	X
22	IMP, SHAFT-FEED	JC70-10229A	1	X
23	PLT, GEAR-FEED	JC66-40375A	1	X
24	PLT, GEAR-P/UP DRIVE	JC66-40219A	1	X
25	IMP, GND-FEED	JC70-10991A	1	X

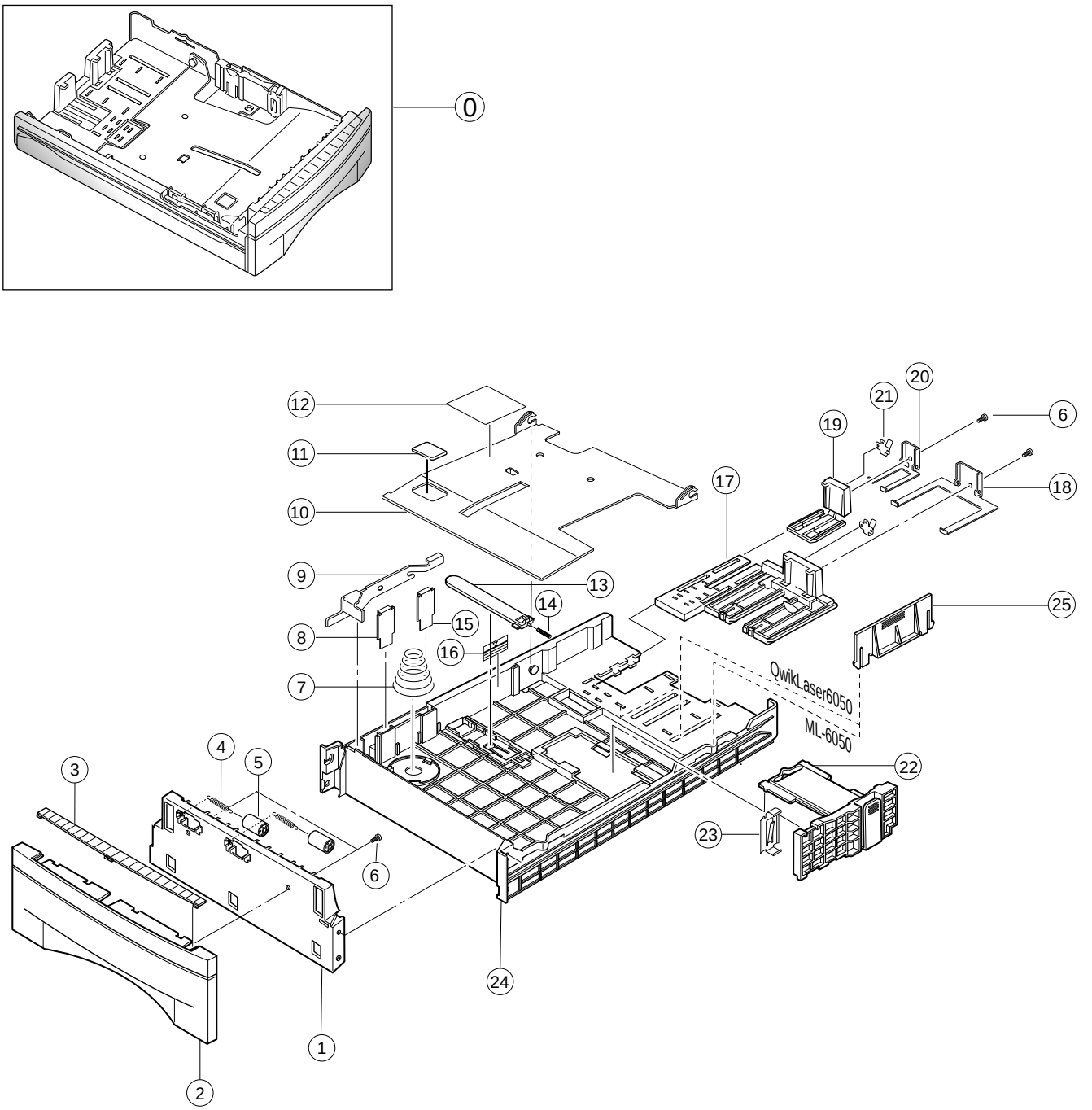
6-7. Cassette Exploded View



Cassette Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	MEA RACK-FEEDER CAS	JC97-01077A	1	O
1	PMO-TRAY-MANUAL	JC72-41387A	1	X
2	PMO-HOLDER FINGER	JC72-41182A	1	X
3	IMP, FINGER	JC70-10213A	1	X
4	IMP, GUIDE PLATE-PAPER	JC70-10219A	2	X
5	SPRING-KNOCK UP	JC61-70951A	1	X
6	LOCKER-PLATE	JC72-41210A	1	X
7	MMP, PAD	JC73-10911A	1	X
8	LABEL-PLATE	JC68-30929A	1	X
9	IPR-PLT KNOCK UP(12)	JC70-11022A	1	X
10	SPRING-LOCKERPLATE	JG61-70531A	1	X
11	LABEL-HEIGHT	JG68-30572A	1	X
12	PMO-GUIDE LEGAL	JC72-41393A	1	X
13	IPR-BRACKET_LEGAL	JC70-11086A	1	X
14	PMO-GUIAE_LETTER	JC72-41392A	1	X
15	IPR-BRACKET_LETTER	JC70-11087A	1	X
16	IPR-TENSION_LETTER	JC70-11085A	2	X
17	PMO-ADJUSTER_S CAST	JC72-41394A	1	X
18	IPR-GUIDE-PLATE	JC70-10993A	1	X
19	PMO-FRAME_CASSETTE, P	JC72-41382A	1	X
20	SCREW-TAPTITE M3x10 FH, WHITE	6003-000002	4	X
21	GUIDE-CASSETTE, M	JC72-00013A	1	X
22	PMO-GUIDE SUB CAST.	JC72-41225A	1	X
23	PMO-GUIDE REAR	JC72-41180A	1	X

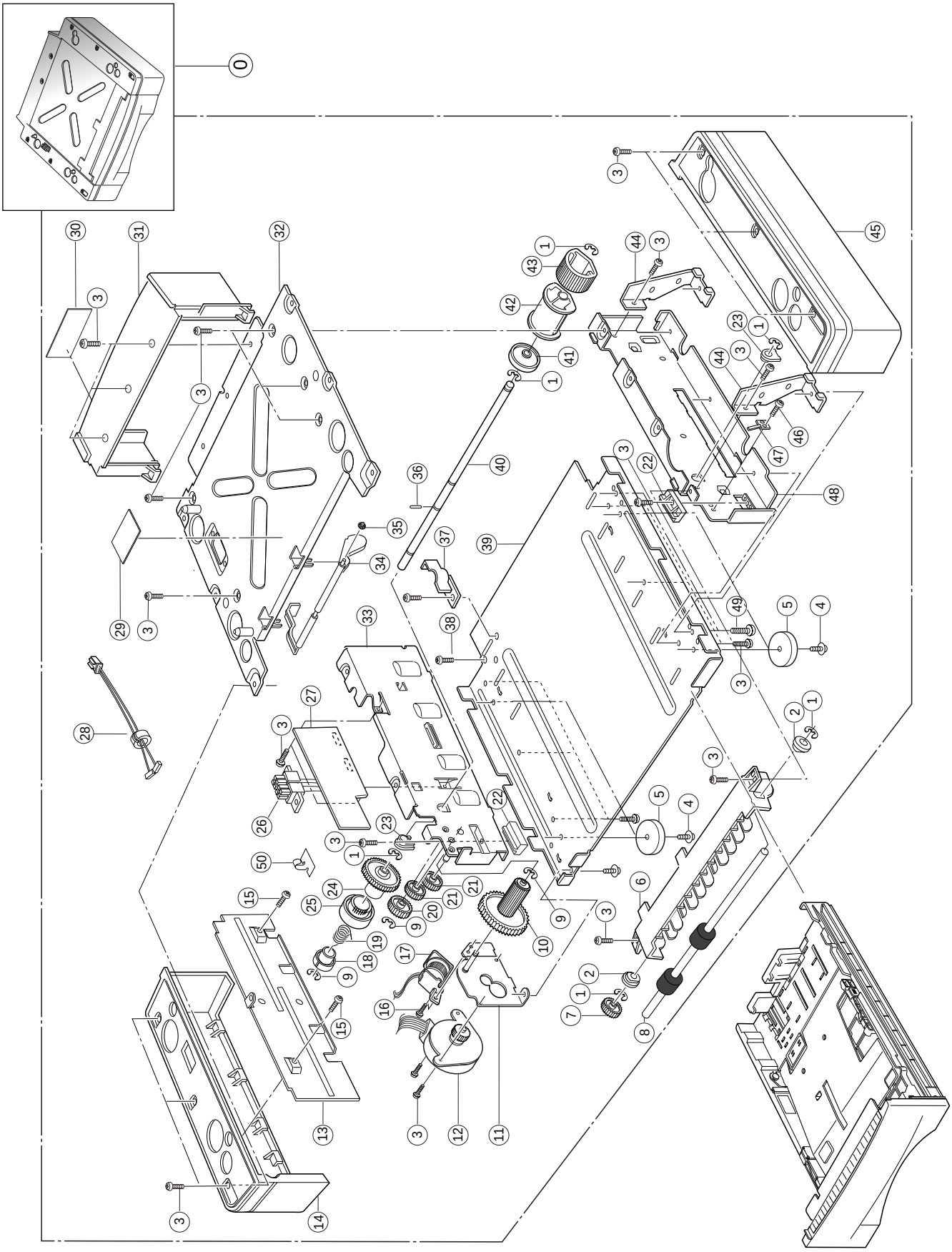
6-8. Second Cassette Exploded View



Second Cassette Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	MEA RACK-CAST.SCF	JC97-01196A	1	X
1	GUIDE CST	JC72-40306A	1	X
2	PMO-GUIDE-2'ND CAST.	JC72-41227A	1	X
3	PLATE-COLOR	JC72-41226A	1	X
4	SPRING ES	6107-001047A	2	X
5	ROLLER EXIT	JC72-40361A	2	X
6	TAPTITE SCREW	6003-000196	2	X
7	SPRING KNOCKUP	JC61-70951A	1	X
8	GUIDE SCF	JC70-11076A	1	X
9	FINGER	JC70-10213A	1	X
10	PLT KNOCK-UP (12)	JC70-11022A	1	X
11	MMP, PAD	JC73-10911A	1	X
12	LABEL(R) PLATE	JC68-30929A	1	X
13	LOCKER-PLATE	JC72-41210A	1	X
14	SPRING-LOCKER PLATE	JG61-70531A	1	X
15	GUIDE PAPER	JC70-10219A	1	X
16	LABEL(R) HEIGHT	JG68-30572A	1	X
17	GUIDE-LEGAL	JC72-41180A	1	X
18	IPR-BRACKET_LEGAL	JC70-11086A	1	X
19	PMO-GUIDE_LETTER	JC72-41392A	1	X
20	IPR-BRACKET_LETTER	JC70-11087A	1	X
21	IPR-TENSION_LETTER	JC70-11085A	2	X
22	GUIDE-SIDE CASSETTE	JC72-41116A	1	X
23	GUIDE PLATE	JC70-10993A	1	X
24	FRAME-CASSETTE	JC72-41183A	1	X
25	PMO-GUIDE REAR	JC72-41180A	1	X

6-9. Second Cassette Frame Exploded View



Second Cassette Frame Parts Lists

Location No.	Description	SEC. Code	Q'ty	Remark
0	ELA HOU-SCF(ML-6050)	JC96-01268A	1	X
1	E-RING	6044-000126	4	X
2	BEARING ROLLER IDLER	JC66-10304A	2	X
3	TAPTITE SCREW	6003-000179	23	X
4	TAPTITE SCREW	6003-000344	4	X
5	FOOT RUBBER	JC61-40301A	4	X
6	GUIDE INNER UPPER	JC72-40307B	1	X
7	GEAR-FEED	JC66-40014A	1	X
8	ROLLER-INNER UPPER	JC75-10028A	1	X
9	E-RING	6044-000125	5	X
10	GEAR DOUBLE OPTION	JC66-40363A	1	X
11	BRKT MOTOR (SCF)	JC70-10986A	1	X
12	STEP MOTOR	3101-001158	1	X
13	SHIELD-PCB	JC70-10451A	1	X
14	COVER-LEFT	JC72-40368B	1	X
15	TAPTITE SCREW	6002-000194	9	X
16	MACHINE SCREW	6001-000131	4	X
17	SOLENOID-MAGNET	JC33-10001A	1	X
18	HUB CLUTCH	JC72-40587A	1	X
19	SPRING-TS,CLUTCH	JC61-70331A	1	X
20	GEAR IDLER OPTION	JC66-40365A	1	X
21	GEAR IDLE Z19	JC66-40012A	2	X
22	GUIDE RAIL	JC72-40371A	2	X
23	BEARING-FEED	JC72-40531A	2	X
24	GEAR P/UP OPTION	JC66-40364A	1	X
25	COLLAR CLUTCH P1	JC72-40569B	1	X
26	CBF HARNESS	JC39-40544A	1	X
27	PBA MAIN	JC92-01077A	1	X
28	CBF HARNESS	JC39-40305A	1	X
29	LABEL WARNING	JC68-20417A	1	X
30	LABEL(R)-SCF(12)	JC68-30936A	1	X
31	COVER-REAR	JC72-40362B	1	X
32	FRAME UPPER	JC70-10027A	1	X
33	FRAME LEFT(SCF)	JC70-10023A	1	X
34	ACTUATOR-ARM	JC72-40370A	1	X
35	CS STOP RING	6044-000001	1	X
36	PIN PARELLED,P/U	JC70-40360A		X
37	STOPPER-SCF	JC72-41347A	1	X

Location No.	Description	SEC. Code	Q'ty	Remark
38	MACHINE SCREW	6001-001532	2	X
39	FRAME LOWER	JC70-11065A	1	X
40	SHAFT PICKUP	JC70-40002A	1	X
41	IDLE-SCF	JC72-41348A	1	X
42	HODER-HOUSING	JC72-40654A	1	X
43	RUBBER P/UP	JC73-40907A	1	X
44	BRKT SUPPORT	JC70-10461A	2	X
45	COVER-RIGHT	JC72-40367B	1	X
46	TAPTITE SCREW	6003-000205	1	X
47	GROUND ROLLER	JC70-10467A	1	X
48	FRAME RIGHT(SCF)	JC70-10022A	1	X
49	MACHINE SCREW	6001-000153	2	X
50	CABLE CLAMP	6502-000003	1	X

7. Electrical Parts Lists

7-1. Engine PBA

7-1-1. Engine PBA (ML-6050 : 110V)

	SEC. Code	Location No.	Description	Spec
	JC92-01047A		**ENGINE (110V)**	
	0201-000008	-	ADHESIVE-HM	PP_#3748, WHT, 6500CPS, -
	1102-000239	U2	IC-EPROM	27C256, 32Kx8BIT, DIP, 28P, 600MIL
	0401-000005	D154, D209	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D215, D220	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D221, D222, D223, D224	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D225, D226, D227, D228	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D229, D230, D231, D232	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D233, D401	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D4, D5, D6, D7, D101	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D500, D501, D502	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D504, D505	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0402-000012	D102	DIODE-RECTIFIER	UF4007, 1KV, 1A, DO-41, TP
	0402-000129	D1, D216, D217	DIODE-RECTIFIER	1N4003, 200V, 1A, DO-41, TP
	0402-000129	D503	DIODE-RECTIFIER	1N4003, 200V, 1A, DO-41, TP
	0402-000145	D103	DIODE-RECTIFIER	1N4937, 600V, 1A, DO-41, -
	0402-000468	D205, D206, D207, D208	DIODE-RECTIFIER	ESJS58-06, 6KV, 2mA, DO-201
	0402-001193	D201, D202, D203, D204	DIODE-RECTIFIER	SHV-04, 4KV, 20mA, -, TP
	0402-001193	D210	DIODE-RECTIFIER	SHV-04, 4KV, 20mA, -, TP
	0403-000227	ZD102	DIODE-ZENER	1N751A, 5.1V, 5%, 500mW, DO-35, TP
	0403-000338	ZD103	DIODE-ZENER	UZ27BM, 27V, 25.7-28.0V, 500mW, DO
	0403-000346	ZD152, ZD204, ZD205	DIODE-ZENER	UZ33B, 33V, 30-36V, 500mW, DO-35, T
	0403-000356	ZD151, ZD201	DIODE-ZENER	UZ5.6BCB, 5.6V, 5.46-5.7V, 500mW,
	0403-000475	ZD203	DIODE-ZENER	1N5274B, 130V, 5%, 500mW, DO-35, TP
	0403-000554	ZD202	DIODE-ZENER	UZ7.5BM, 7.2-7.7V, 500mW, DO-35, T
	0501-000010	Q211	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000010	Q3, Q4, Q8, Q10, Q208	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000010	Q500, Q503	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000294	Q207, Q209	TR-SMALL SIGNAL	KSA708-Y, PNP, 800mW, TO-92, TP, 12
	0501-000294	Q501, Q502	TR-SMALL SIGNAL	KSA708-Y, PNP, 800mW, TO-92, TP, 12
	1203-000002	U151	IC-POSI.ADJUST REG.	431, TO-92, 3P, -, PLASTIC, 2.44/2.
	2001-000003	JP122	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -
	2001-000003	R25, R52, R111, R151	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -
	2001-000003	R406	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -

	SEC. Code	Location No.	Description	Spec
	2001-000005	R221, R231	R-CARBON	390OHM, 5%, 1/8W, AA, TP, -
	2001-000010	R240	R-CARBON	68KOHM, 5%, 1/8W, AA, TP, -
	2001-000012	R236	R-CARBON	680KOHM, 5%, 1/8W, AA, TP, -
	2001-000015	R62	R-CARBON(S)	0.5OHM, 5%, 1/2W, AA, TP, -
	2001-000016	R8	R-CARBON(S)	1OHM, 5%, 1/2W, AA, TP, -
	2001-000019	R217, R230	R-CARBON(S)	10OHM, 5%, 1/2W, AA, TP, -
	2001-000023	R109	R-CARBON	47OHM, 5%, 1/4W, AA, TP, -
	2001-000027	R104	R-CARBON	100OHM, 5%, 1/4W, AA, TP, -
	2001-000045	R274	R-CARBON	1.8KOHM, 5%, 1/4W, AA, TP, -
	2001-000085	R106, R107	R-CARBON(S)	100KOHM, 5%, 1/2W, AA, TP, -
	2001-000105	R14	R-CARBON	1.5KOHM, 5%, 1/4W, AA, TP, -
	2001-000118	R103	R-CARBON(S)	180OHM, 5%, 1/2W, AA, TP, -
	2001-000221	R39	R-CARBON	1.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000273	R238	R-CARBON	100KOHM, 5%, 1/8W, AA, TP, -
	2001-000281	R15, R24, R29, R30, R31	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R155, R252, R282, R283	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R284, R285, R293, R422	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R514	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000294	R205	R-CARBON	10MOHM, 5%, 1/4W, AA, TP, -
	2001-000319	R215	R-CARBON	120KOHM, 5%, 1/8W, AA, TP, -
	2001-000331	R56, R63	R-CARBON	12KOHM, 5%, 1/8W, AA, TP, -
	2001-000362	R16, R23, R64	R-CARBON	150OHM, 5%, 1/8W, AA, TP, -
	2001-000362	R512	R-CARBON	150OHM, 5%, 1/8W, AA, TP, -
	2001-000429	R18, R33, R34	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R408	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R41, R42, R44, R45, R46	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R49	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000435	R502	R-CARBON	1MOHM, 5%, 1/8W, AA, TP, -
	2001-000449	R48, R225, R250, R256	R-CARBON	2.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000449	R501, R504	R-CARBON	2.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000515	R27, R424, R425, R426	R-CARBON	220OHM, 5%, 1/8W, AA, TP, -
	2001-000552	R112	R-CARBON	270OHM, 5%, 1/4W, AA, TP, -
	2001-000563	R253	R-CARBON	27KOHM, 5%, 1/8W, AA, TP, -
	2001-000565	R517	R-CARBON	27OHM, 5%, 1/2W, AA, TP, -
	2001-000577	R152	R-CARBON	2KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R249	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R257, R263, R266	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R500, R503, R507	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000734	R110	R-CARBON	4.7KOHM, 5%, 1/8W, AA, TP, -

	SEC. Code	Location No.	Description	Spec
	2001-000734	R251	R-CARBON	4.7KOHM, 5%, 1/8W, AA, TP, -
	2001-000761	R218	R-CARBON	430OHM, 5%, 1/8W, AA, TP, -
	2001-000780	R156	R-CARBON	470OHM, 5%, 1/8W, AA, TP, -
	2001-000786	R54, R223, R224, R227	R-CARBON	47KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R19, R26, R28, R35, R36	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R261, R405	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R38, R40, R51, R59	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R60, R61, R260	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000816	R113	R-CARBON	5.6OHM, 5%, 1/4W, AA, TP, -
	2001-000832	R20, R407	R-CARBON	510OHM, 5%, 1/8W, AA, TP, -
	2001-000864	R53, R248	R-CARBON	56KOHM, 5%, 1/8W, AA, TP, -
	2001-001015	R262	R-CARBON	9.1KOHM, 5%, 1/8W, AA, TP, -
	2001-001070	R102	R-CARBON(S)	120OHM, 5%, 1/2W, AA, TP, -
	2001-001093	R292	R-CARBON(S)	2.2KOHM, 5%, 1/2W, AA, TP, -
	2001-001119	R210, R212, R226, R229	R-CARBON(S)	3.3MOHM, 5%, 1/2W, AA, TP, -
	2001-001119	R239	R-CARBON(S)	3.3MOHM, 5%, 1/2W, AA, TP, -
	2001-001150	R101, R105	R-CARBON(S)	470KOHM, 5%, 1/2W, AA, TP, -
	2001-001165	R216, R219	R-CARBON(S)	56OHM, 5%, 1/2W, AA, TP, -
	2004-000002	R247	R-METAL	78.7Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000003	R237	R-METAL	16.2Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000345	R17, R22, R55, R222	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000345	R43	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000345	R513	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000385	R510, R268	R-METAL	17.4Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000433	R58, R213	R-METAL	1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000544	R508	R-METAL	21.5Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000691	R153	R-METAL	3.16Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000699	R57, R516	R-METAL	3.3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000754	R511	R-METAL	309Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000869	R154	R-METAL	3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000884	R37	R-METAL	4.3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000900	R47	R-METAL	4.7Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000965	R243	R-METAL	470Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-001156	R509	R-METAL	619Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-001231	R269	R-METAL	75Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-001231	R506	R-METAL	75Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-001315	R234	R-METAL	86.6Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-001315	R505	R-METAL	86.6Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-001357	R233	R-METAL	93.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2

	SEC. Code	Location No.	Description	Spec
	2004-001357	R515	R-METAL	93.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-002001	R245	R-METAL	12.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-004179	R258	R-METAL	174KOHM, 1%, 1/8W, AA, TP, 1.8X3.2MM
	2005-000164	R114	R-WIRE WOUND, NON	0.1ohm, 5%, 2W, AA, BK, 4x12mm
	2009-001041	R208, R209	R-METAL GLAZE	2Mohm, 1%, 1/4W, AA, TP, 3X9mm
	2009-001042	R204, R207, R277	R-METAL GLAZE	4.7Mohm, 1%, 1/4W, AA, TP, 3x9mm
	2201-000003	C203	C-CERAMIC, DISC	68pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000004	C220	C-CERAMIC, DISC	100pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000004	C404	C-CERAMIC, DISC	100pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000017	C17, C22, C27, C29	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000017	C31, C38, C39, C40, C41	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000017	C42, C43, C45, C237	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000019	C106, C501	C-CERAMIC, DISC	10nF, +80-20%, 500V, Y5V, TP, 13.5x
	2201-000119	C209	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000119	C222, C226, C227, C229	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000119	C26, C32, C34, C37, C46	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000138	C16, C28, C30, C402	C-CERAMIC, DISC	100pF, 10%, 50V, Y5P, TP, 4.0X4.0, 2
	2201-000162	C1, C13, C14	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C19	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C217, C231	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C24, C36	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C405	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000326	C221, C223, C225	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000326	C230	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000326	C500	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000391	C20, C21	C-CERAMIC, DISC	22pF, 5%, 50V, SL, TP, 5.0x3.0, 5
	2201-000473	C207, C208, C210, C214	C-CERAMIC, DISC	33nF, +80-20%, 50V, Y5V, TP, 6x3, 5
	2201-000473	C224	C-CERAMIC, DISC	33nF, +80-20%, 50V, Y5V, TP, 6x3, 5
	2201-000645	C111	C-CERAMIC, DISC	680pF, 5%, 50V, SL, TP, 10*3, 5
	2201-000724	C201, C204, C219	C-CERAMIC, DISC	470pF, 0.1, 3KV, Y5P, TP, 8x5, 5
	2201-000724	C202, C206	C-CERAMIC, DISC	470pF, 0.1, 3KV, Y5P, TP, 8x5, 5
	2202-000002	C10, C12, C15, C18, C401	C-CERAMIC, MLC-AXIAL	10nF, 0.05, 500V, X7R, TP, 5.1x6.4x
	2202-000002	C502	C-CERAMIC, MLC-AXIAL	10nF, 0.05, 500V, X7R, TP, 5.1x6.4x
	2202-000654	C110, C112	C-CERAMIC, MLC-RADIAL	100nF, 10%, 50V, X7R, TP, 5.1x6.6, 5
	2301-000490	C113, C505	C-FILM, PEF	4.7nF, 5%, 100V, TP, 5.8x3.1x12.5,
	2401-000207	C228, C503, C504, C506	C-AL	100uF, 20%, 50V, WT, TP, 8x12, 5
	2401-000613	C109, C152	C-AL	1uF, 20%, 50V, WT, TP, 5x11, 5
	2401-001476	C11	C-AL	47uF, 20%, 10V, GP, TP, 6.3x5mm, 2.5
	2401-001585	C114	C-AL	47uF, 20%, 50V, WT, TP, 8x11.5, 5

	SEC. Code	Location No.	Description	Spec
	2401-001700	C153, C154, C155	C-AL	470uF, 20%, 10V, -, -, 10x12.5, -
	2401-002075	C33, C35	C-AL	4.7uF, 20%, 50V, GP, TP, 5x11, 5
	2902-001011	BD1, BD101, BD102	FILTER-LINE	-, -, -
	2902-001011	BD103, BD151, BD152	FILTER-LINE	-, -, -
	3301-000344	FB1, FB2, FB3, FB4, FB5	CORE-FERRITE BEAD	ZZ, 3.5x6.5mm, -, -
	3602-000001	FH1, FH2, FH3, FH4	FUSE-CLIP	-, -, 30mohm
	JC39-40511A	JP104, JP105, JP106, JP107,	CBF HARNESS-	ML-80, JUMPER, AWG22, 52mm, SILVER
		JP108, JP109, JP110, JP111,		
		JP112, JP113, JP114, JP115,		
		JP116, JP117, JP118, JP119,		
		JP120, JP121, JP123, JP124,		
		JP125, JP126, JP127, JP128,		
		JP129, JP130, JP131, JP132,		
		JP133, JP134, JP135, JP136,		
		JP137, JP138, JP139, JP140,		
		JP141, JP142, JP142, JP143,		
		JP144, JP145, JP146, JP147,		
		JP148, JP149, JP150, JP151,		
		JP152, JP153, JP154, JP155,		
		JP156, JP157, JP158, JP159,		
		JP160, JP16, JP17, JP21, JP22,		
		JP23, JP161, JP162, JP163,		
		JP164, JP165, JP166, JP167,		
		JP168, JP169, JP170, JP173,		
		JP174, JP175, JP176, JP177,		
		JP178, JP179, JP180, JP181,		
		JP182, JP188, JP189, JP190,		
		JP191, JP192, JP193, JP194,		
		JP195, JP196, JP197, JP198,		
		JP199, JP200, JP203, JP187,		
		JP268, JP204, JP205, JP206,		
		JP208, JP209, JP210, JP211,		
		JP212, JP213, JP214, JP217,		
		JP218, JP219, JP220, JP221,		
		JP222, JP223, JP224, JP225,		
		JP226, JP227, JP228, JP229,		
		JP230, JP231, JP232, JP233,		
		JP234, JP25, JP26, JP27, JP28,		
		JP272, JP273, JP274, JP275,		

	SEC. Code	Location No.	Description	Spec
	JC39-40511A	JP29, JP30, JP31, JP216,	CBF HARNESS-	ML-80, JUMPER, AWG22, 52mm, SILVER
		JP276, JP601, JP33, JP34,		
		JP35, JP36, JP37, JP38, JP39,		
		JP40, JP41, JP42, JP43, JP44,		
		JP45, JP46, JP47, JP49, JP50,		
		JP51, JP52, JP55, JP56, JP57,		
		JP58, JP59, JP60, JP62, JP63,		
		JP602, JP605, JP616, JP7,		
		JP617, R412, JP65, JP66,		
		JP67, JP68, JP69, JP70, JP71,		
		JP72, JP73, JP74, JP75, JP76,		
		JP77, JP78, JP79, JP80, JP8,		
		JP10, JP11, JP13, JP81, JP82,		
		JP83, JP84, JP85, JP86, JP87,		
		JP88, JP89, JP90, JP91, JP92,		
		JP93, JP94, JP95, JP96, JP97,		
		JP98, JP99, JP100, JP101,		
		JP102, JP103, JS3, JS4, JS5,		
		JP4, JP5, JP6		
	JC41-10529A	-	PCB-ENGINE	ML-5500, FR-1, 1L, T1.6, 247X299mm
	0402-000104	DB101	DIODE-BRIDGE	D3SBA60, 600V, 4A, -, ST
	0502-000245	Q9	TR-POWER	KSB1151-Y, PNP, 1.3W, TO-126, -, 16
	0502-001124	Q201, Q202, Q203, Q204	TR-POWER	KSD526, NPN, 30W, TO-220, BK, 120-2
	0604-000001	PC152, PC153	PHOTO-COUPLER	TR, 50-60%, 200mW, DIP-4, ST
	0604-000146	PC151	PHOTO-COUPLER	TRIAC, -, 250mW, DIP-6, ST
	0604-001033	OP1, OP2, OP3, OP4	PHOTO-INTERRUPTER	TR, -, 150mW, DIP-4, ST
	0801-000528	U4	IC-CMOS LOGIC	74HCT574, D FLIP-FLOP, DIP, 20P, 3
	0801-000722	U6	IC-CMOS LOGIC	74HC245, TRANSCEIVER, DIP, 20P, 30
	0803-000679	U205	IC-TTL	7406, BUFFER/DRIVER, DIP, 14P, 300
	0803-001097	U203	IC-TTL	7407, BUFFER/DRIVER, DIP, 14P, 300
	0903-000219	U3	IC-MICROCOMPUTER	88C4316, 8BIT, DIP, 64P, -, 8MHz, ST
	1201-000229	U201	IC-OP AMP	324, DIP, 14P, 300MIL, QUAD, 100V/m
	1202-000103	U5	IC-VOLTAGE COMP.	393, DIP, 8P, 300MIL, DUAL, 36V, CMO
	1203-000258	U202	IC-POSI.FIXED REG.	7818, TO-220, 3P, -, PLASTIC, 17.3/
	1203-000531	U101	IC-SWITCH VOL. REG.	5311, DIP, 8P, 300MIL, PLASTIC, -, 3
	1404-000167	TH101	THERMISTOR-NTC	5ohm, 10%, 3150K, 18.7mW/C, TP
	1405-000147	TNR101	VARISTOR	470V, 4500A, 17x12mm, BK
	2003-000703	R157, R158	R-METAL OXIDE(S)	470ohm, 5%, 3W, AA, TP, 6x16mm
	2003-000706	R108	R-METAL OXIDE(S)	47Kohm, 5%, 2W, AA, TP, 4.3x12mm

	SEC. Code	Location No.	Description	Spec
	2009-001082	R280	R-METAL GLAZE	30Mohm, 2%, 2W, -, BK, 30x8.5mm
	2009-001083	R220	R-METAL GLAZE	200Mohm, 2%, 1/2W, CM, BK, 18x6mm
	2009-001084	R211	R-METAL GLAZE	30Mohm, 2%, 0.5W, CM, BK, 18x6mm
	2009-001085	R201	R-METAL GLAZE	10Mohm, 3%, 1/2W, CM, BK, 18x4mm
	2103-000156	VR201, VR202, VR204	VR-SEMI	10Kohm, 10%, 1/2W, TOP
	2103-000270	VR203	VR-SEMI	20Kohm, 10%, 1/2W, TOP
	2103-001079	VR205	VR-SEMI	100Kohm, 15%, 1/2W, TOP
	2201-000023	C103, C104, C115	C-CERAMIC, DISC	2.2nF, 20%, 125V, Y5U, TP, 11x7, 5
	2201-000154	C108	C-CERAMIC, DISC	10nF, +80-20%, 2KV, Y5P, TP, 20x5, 1
	2201-002066	C211, C212, C215, C216	C-CERAMIC, DISC	470pF, 10%, 6KV, Y5P, TP, 10x7, 10
	2201-002067	C213	C-CERAMIC, DISC	100pF, 10%, 6KV, Y5P, TP, 8x7, 10
	2301-000323	C101	C-FILM, PEF	220nF, 0.1, 250V, -, -, -
	2305-000002	C102	C-FILM, MPEF	47nF, 20%, 250VAC, BK, 18X12.5X5.5
	2401-000183	C156, C157	C-AL	1000uF, 20%, 35V, WT, TP, 12.5x25, 5
	2401-000697	C151	C-AL	2200uF, 20%, 16V, WT, TP, 12.5x25, 5
	2401-003203	C107	C-AL	470uF, 20%, 200V, GP, BK, 30X25, 10m
	2801-000002	X1	CRYSTAL-UNIT	6.94407MHz, 50ppm, 28-AAM, 20pF, 5
	3405-000125	SW151, SW152	SWITCH-MICRO	125V, 5A, 50gf, SPDT
	3601-000151	F151	FUSE-FERRULE	125V, 5A, NON TIME, GLASS, 5x20mm
	3601-000157	F101	FUSE-FERRULE	125V, 8A, SLOW BLOW, GLASS, 5x20mm
	3704-000235	U2	SOCKET-IC	28P, DIP, SN, 2.54mm
	3711-000164	CN4	CONNECTOR-HEADER	1WALL, 2P, 1R, 2.5mm, STRAIGHT, SN
	3711-000217	CN101	CONNECTOR-HEADER	1WALL, 3P, 1R, 3.96mm, STRAIGHT, SN
	3711-000633	CN3	CONNECTOR-HEADER	BOX, 11P, 1R, 2mm, STRAIGHT, SN
	3711-000782	CN105	CONNECTOR-HEADER	BOX, 2P, 1R, 2.0mm, STRAIGHT, SN
	3711-000865	CN103	CONNECTOR-HEADER	BOX, 3P, 1R, 2mm, STRAIGHT, SN
	3711-001108	CN6	CONNECTOR-HEADER	BOX, 8P, 1R, 2mm, STRAIGHT, SN
	3711-002104	CN102	CONNECTOR-HEADER	1WALL, 2P, 1R, 7.92mm, STRAIGHT, SN
	3711-002410	CN104	CONNECTOR-HEADER	BOX, 10P, 2R, 2mm, STRAIGHT, SN
	3711-002653	CN7	CONNECTOR-HEADER	BOX, 3P, 1R, 2.5mm, STRAIGHT, SN
	3711-003204	CN5	CONNECTOR-HEADER	BOX, 24P, 2R, 2mm, STRAIGHT, SN
	3711-003205	CN2	CONNECTOR-HEADER	BOX, 4P, 1R, 2.0mm, STRAIGHT, SN
	3711-003969	CN8, CN10	CONNECTOR-HEADER	BOX, 2P, 1R, 2.5mm, STRAIGHT, SN
	JC26-20301B	T201	TRANS AF-	ML-80, -, 95MH
	JC26-20301B	T202, T204	TRANS AF-	ML-80, -, 95MH
	JC26-20301C	T101	TRANS AF-	ML-80, -, 0.4WIRE
	JC26-30506A	T203	TRANS POWER-THV	ML-7000, -, 57.5/1.3uH, 180mH
	JC27-40502A	L103	COIL CHOCK-68UH	ML5500, 68uH, 0.04ohm, 32T
	JC27-60101B	L152	COIL FILTER-	-, 9UH, -, -

	SEC. Code	Location No.	Description	Spec
	JC27-60101C	L151	COIL FILTER-	-, 6UH, -, -
	JC27-60502A	L101	COIL FILTER-LINE110V	ML5500, 7.0mH, 0.10ohm, 26T
	JC27-60503A	L102	COIL FILTER-3MH	ML5500, 3.0mH, 0.40ohm, 30T
	JC33-10501B	-	SOLENOID-6000	ML-6000, 24VDC, 72W, 57, 39X39X22,
	JC70-10909A	HP1, HP2, HP3, HP4	IPR-CONNECTOR HV	ML-80, AL, T0.8, -
	JC96-00320A	-	ELA HOU-H/SINK	ML-80(SEAU), -, EUROPE, -, -, -, -
	0402-000304	D153	DIODE-RECTIFIER	STPR1020CF, 200V, 5A, TO-220, ST
	0402-000314	D152	DIODE-RECTIFIER	D10SC4M, 40V, 10A, ITO-220
	0502-001124	Q201, Q203	TR-POWER	KSD526, NPN, 30W, TO-220, BK, 120-2
	0505-000134	Q102	FET-SILICON	IRF840, N, 500V, 8A, 0.85OHM, 125W,
	TO-220AB			
	1401-000108	Q101	THYRISTOR-TRIAC	100A, 600V, -, 5V/uS, TO-220AB
	6003-000008	Q201, Q101	SCREW-TAPTITE	BH, +, S, M3, L4, ZPC3, SWRCH18A
	6003-000119	D152, D153, Q203	SCREW-TAPTITE	BH, +, B, M3, L8, CBLACK, SWRCH18A
	JC61-70100A	FOR SMPS H/SINK	SPRING-PS	ML-66G, STS304-W1/2H, T0.5, -, -, -
	JC62-20001A	Q102	TUBE-IRF840	SSP5N90, IRF840, -, T0.45, L23, -
	JC62-30001A	Q102, D152.D153	HEAT SINK-TRANS	ML-80, AL, -
	JC62-30002A	Q203	HEAT SINK-SMPS	ML-80, AL, -
	JF62-30201A	Q101, Q201	HEAT SINK	HVPS, SPCC, t1.0
	JF68-30527H	-	LABEL(R)-BAR CODE	SF1000, PY, 38X6.5, T0.1, WHT
	JF68-30527N	-	LABEL(R)-BAR CODE	SF500, PY, 20X10, T0.1, WHT

7-1-2. Engine PBA (ML-6050 : 220V)

	SEC. Code	Location No.	Description	Spec
	JC92-01051A		**ENGINE (220V)**	
	0201-000008	-	ADHESIVE-HM	PP_#3748,WHT,6500CPS,-
	1102-000239	U2	IC-EPROM	27C256,32Kx8BIT,DIP,28P,600MIL
	0401-000005	D154,D209	DIODE-SWITCHING	1N4148,75V,200MA,DO-35,TP
	0401-000005	D215, D220	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D221, D222, D223, D224	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D225, D226, D227, D228	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D229, D230, D231, D232	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D233, D401	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D4, D5, D6, D7, D101	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D500, D501, D502	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0401-000005	D504, D505	DIODE-SWITCHING	1N4148, 75V, 200MA, DO-35, TP
	0402-000012	D102	DIODE-RECTIFIER	UF4007, 1KV, 1A, DO-41, TP
	0402-000129	D1, D216, D217	DIODE-RECTIFIER	1N4003, 200V, 1A, DO-41, TP
	0402-000129	D503	DIODE-RECTIFIER	1N4003, 200V, 1A, DO-41, TP
	0402-000145	D103	DIODE-RECTIFIER	1N4937, 600V, 1A, DO-41, -
	0402-000468	D205, D206, D207, D208	DIODE-RECTIFIER	ESJS58-06, 6KV, 2mA, DO-201
	0402-001193	D201, D202, D203, D204	DIODE-RECTIFIER	SHV-04, 4KV, 20mA, -, TP
	0402-001193	D210	DIODE-RECTIFIER	SHV-04, 4KV, 20mA, -, TP
	0403-000227	ZD102	DIODE-ZENER	1N751A, 5.1V, 5%, 500mW, DO-35, TP
	0403-000338	ZD103	DIODE-ZENER	UZ27BM, 27V, 25.7-28.0V, 500mW, DO
	0403-000346	ZD152, ZD204, ZD205	DIODE-ZENER	UZ33B, 33V, 30-36V, 500mW, DO-35, T
	0403-000356	ZD151, ZD201	DIODE-ZENER	UZ5.6BCB, 5.6V, 5.46-5.7V, 500mW,
	0403-000475	ZD101, ZD203	DIODE-ZENER	1N5274B, 130V, 5%, 500mW, DO-35, TP
	0403-000554	ZD202	DIODE-ZENER	UZ7.5BM, 7.2-7.7V, 500mW, DO-35, T
	0501-000010	Q211	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000010	Q3, Q4, Q8, Q10, Q208	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000010	Q500, Q503	TR-SMALL SIGNAL	KSC1008, NPN, 800mW, TO-92, TP, 120
	0501-000294	Q207, Q209	TR-SMALL SIGNAL	KSA708-Y, PNP, 800mW, TO-92, TP, 12
	0501-000294	Q501, Q502	TR-SMALL SIGNAL	KSA708-Y, PNP, 800mW, TO-92, TP, 12
	1203-000002	U151	IC-POSI.ADJUST REG.	431, TO-92, 3P, -, PLASTIC, 2.44/2.
	2001-000002	R107	R-CARBON(S)	200KOHM, 5%, 1/2W, AA, TP, -
	2001-000003	JP122	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -
	2001-000003	R25, R52, R111, R151	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -
	2001-000003	R406	R-CARBON	330OHM, 5%, 1/8W, AA, TP, -
	2001-000005	R221, R231	R-CARBON	390OHM, 5%, 1/8W, AA, TP, -
	2001-000010	R240	R-CARBON	68KOHM, 5%, 1/8W, AA, TP, -

	SEC. Code	Location No.	Description	Spec
	2001-000012	R236	R-CARBON	680KOHM, 5%, 1/8W, AA, TP, -
	2001-000015	R62	R-CARBON(S)	0.5OHM, 5%, 1/2W, AA, TP, -
	2001-000016	R8	R-CARBON(S)	1OHM, 5%, 1/2W, AA, TP, -
	2001-000019	R217, R230	R-CARBON(S)	10OHM, 5%, 1/2W, AA, TP, -
	2001-000023	R109	R-CARBON	47OHM, 5%, 1/4W, AA, TP, -
	2001-000027	R104	R-CARBON	100OHM, 5%, 1/4W, AA, TP, -
	2001-000045	R274	R-CARBON	1.8KOHM, 5%, 1/4W, AA, TP, -
	2001-000105	R14	R-CARBON	1.5KOHM, 5%, 1/4W, AA, TP, -
	2001-000118	R103	R-CARBON(S)	180OHM, 5%, 1/2W, AA, TP, -
	2001-000221	R39	R-CARBON	1.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000273	R238	R-CARBON	100KOHM, 5%, 1/8W, AA, TP, -
	2001-000281	R15, R24, R29, R30, R31	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R155, R252, R282, R283	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R284, R285, R293, R422	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000281	R514	R-CARBON	100OHM, 5%, 1/8W, AA, TP, -
	2001-000294	R205	R-CARBON	10MOHM, 5%, 1/4W, AA, TP, -
	2001-000319	R215	R-CARBON	120KOHM, 5%, 1/8W, AA, TP, -
	2001-000331	R56, R63	R-CARBON	12KOHM, 5%, 1/8W, AA, TP, -
	2001-000362	R16, R23, R64	R-CARBON	150OHM, 5%, 1/8W, AA, TP, -
	2001-000362	R512	R-CARBON	150OHM, 5%, 1/8W, AA, TP, -
	2001-000429	R18, R33, R34	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R408	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R41, R42, R44, R45, R46	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000429	R49	R-CARBON	1KOHM, 5%, 1/8W, AA, TP, -
	2001-000435	R502	R-CARBON	1MOHM, 5%, 1/8W, AA, TP, -
	2001-000449	R48, R225, R250, R256	R-CARBON	2.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000449	R501, R504	R-CARBON	2.2KOHM, 5%, 1/8W, AA, TP, -
	2001-000515	R27, R424, R425, R426	R-CARBON	220OHM, 5%, 1/8W, AA, TP, -
	2001-000552	R112	R-CARBON	270OHM, 5%, 1/4W, AA, TP, -
	2001-000563	R253	R-CARBON	27KOHM, 5%, 1/8W, AA, TP, -
	2001-000565	R517	R-CARBON	27OHM, 5%, 1/2W, AA, TP, -
	2001-000577	R152	R-CARBON	2KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R249	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R257, R263, R266	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000660	R500, R503, R507	R-CARBON	33KOHM, 5%, 1/8W, AA, TP, -
	2001-000734	R110	R-CARBON	4.7KOHM, 5%, 1/8W, AA, TP, -
	2001-000734	R251	R-CARBON	4.7KOHM, 5%, 1/8W, AA, TP, -
	2001-000761	R218	R-CARBON	430OHM, 5%, 1/8W, AA, TP, -
	2001-000780	R156	R-CARBON	470OHM, 5%, 1/8W, AA, TP, -

	SEC. Code	Location No.	Description	Spec
	2001-000786	R54, R223, R224, R227	R-CARBON	47KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R19, R26, R28, R35, R36	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R261, R405	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R38, R40, R51, R59	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000812	R60, R61, R260	R-CARBON	5.6KOHM, 5%, 1/8W, AA, TP, -
	2001-000816	R113	R-CARBON	5.6OHM, 5%, 1/4W, AA, TP, -
	2001-000832	R20, R407	R-CARBON	510OHM, 5%, 1/8W, AA, TP, -
	2001-000864	R53, R248	R-CARBON	56KOHM, 5%, 1/8W, AA, TP, -
	2001-001015	R262	R-CARBON	9.1KOHM, 5%, 1/8W, AA, TP, -
	2001-001070	R102	R-CARBON(S)	120OHM, 5%, 1/2W, AA, TP, -
	2001-001093	R292	R-CARBON(S)	2.2KOHM, 5%, 1/2W, AA, TP, -
	2001-001119	R210, R212, R226, R229	R-CARBON(S)	3.3MOHM, 5%, 1/2W, AA, TP, -
	2001-001119	R239	R-CARBON(S)	3.3MOHM, 5%, 1/2W, AA, TP, -
	2001-001150	R101, R105	R-CARBON(S)	470KOHM, 5%, 1/2W, AA, TP, -
	2001-001165	R216, R219	R-CARBON(S)	56OHM, 5%, 1/2W, AA, TP, -
	2004-000002	R247	R-METAL	78.7Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000003	R237	R-METAL	16.2Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000345	R17, R22, R55, R222	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000345	R43	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000345	R513	R-METAL	15Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000385	R510, R268	R-METAL	17.4Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000433	R58, R213	R-METAL	1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000544	R508	R-METAL	21.5Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000691	R153	R-METAL	3.16Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-000699	R516, R57	R-METAL	3.3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000754	R511	R-METAL	309Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000869	R154	R-METAL	3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-000884	R37	R-METAL	4.3Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000900	R47	R-METAL	4.7Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-000965	R243	R-METAL	470Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-001156	R509	R-METAL	619Kohm, 1%, 1/8W, AA, TP, 1.8x3.2m
	2004-001231	R269	R-METAL	75Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-001231	R506	R-METAL	75Kohm, 1%, 1/8W, AA, TP, 1.8x3.2mm
	2004-001315	R234	R-METAL	86.6Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-001315	R505	R-METAL	86.6Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-001357	R233	R-METAL	93.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-001357	R515	R-METAL	93.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-002001	R245	R-METAL	12.1Kohm, 1%, 1/8W, AA, TP, 1.8x3.2
	2004-004179	R258	R-METAL	174KOHM, 1%, 1/8W, AA, TP, 1.8X3.2MM

	SEC. Code	Location No.	Description	Spec
	2005-000168	R114	R-WIRE WOUND, NON	0.22ohm, 5%, 2W, AA, BK, 4x12mm
	2009-001041	R208, R209	R-METAL GLAZE	2Mohm, 1%, 1/4W, AA, TP, 3X9mm
	2009-001042	R204, R207, R277	R-METAL GLAZE	4.7Mohm, 1%, 1/4W, AA, TP, 3x9mm
	2201-000003	C203	C-CERAMIC, DISC	68pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000004	C220	C-CERAMIC, DISC	100pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000004	C404	C-CERAMIC, DISC	100pF, 10%, 2KV, SL, TP, 8x5, 5
	2201-000017	C17, C22, C27, C29	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000017	C31, C38, C39, C40, C41	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000017	C42, C43, C45, C237	C-CERAMIC, DISC	1nF, 10%, 50V, Y5P, TP, 4x3.5, 5
	2201-000019	C106, C501	C-CERAMIC, DISC	10nF, +80-20%, 500V, Y5V, TP, 13.5x
	2201-000119	C209	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000119	C222, C226, C227, C229	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000119	C26, C32, C34, C37, C46	C-CERAMIC, DISC	100nF, +80-20%, 50V, Y5V, TP, 8x3.5
	2201-000138	C16, C28, C30, C402	C-CERAMIC, DISC	100pF, 10%, 50V, Y5P, TP, 4.0X4.0, 2
	2201-000162	C1, C13, C14	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C19	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C217, C231	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C24, C36	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000162	C405	C-CERAMIC, DISC	10NF, +80-20%, 50V, Y5V, TP, 6.3X3, 5
	2201-000326	C221, C223, C225	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000326	C230	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000326	C500	C-CERAMIC, DISC	2.2nF, 10%, 50V, Y5P, TP, 6.5x3, 5
	2201-000391	C20, C21	C-CERAMIC, DISC	22pF, 5%, 50V, SL, TP, 5.0x3.0, 5
	2201-000473	C207, C208, C210, C214	C-CERAMIC, DISC	33nF, +80-20%, 50V, Y5V, TP, 6x3, 5
	2201-000473	C224	C-CERAMIC, DISC	33nF, +80-20%, 50V, Y5V, TP, 6x3, 5
	2201-000645	C111	C-CERAMIC, DISC	680pF, 5%, 50V, SL, TP, 10*3, 5
	2201-000724	C201, C204, C219	C-CERAMIC, DISC	470pF, 0.1, 3KV, Y5P, TP, 8x5, 5
	2201-000724	C202, C206	C-CERAMIC, DISC	470pF, 0.1, 3KV, Y5P, TP, 8x5, 5
	2202-000002	C10, C12, C15, C18, C401	C-CERAMIC, MLC-AXIAL	10nF, 0.05, 500V, X7R, TP, 5.1x6.4x
	2202-000002	C502	C-CERAMIC, MLC-AXIAL	10nF, 0.05, 500V, X7R, TP, 5.1x6.4x
	2202-000654	C110, C112	C-CERAMIC, MLC-RADIAL	100nF, 10%, 50V, X7R, TP, 5.1x6.6, 5
	2301-000490	C113, C505	C-FILM, PEF	4.7nF, 5%, 100V, TP, 5.8x3.1x12.5,
	2401-000207	C228, C503, C504, C506	C-AL	100uF, 20%, 50V, WT, TP, 8x12, 5
	2401-000613	C109, C152	C-AL	1uF, 20%, 50V, WT, TP, 5x11, 5
	2401-001476	C11	C-AL	47uF, 20%, 10V, GP, TP, 6.3x5mm, 2.5
	2401-001585	C114	C-AL	47uF, 20%, 50V, WT, TP, 8x11.5, 5
	2401-001700	C153, C154, C155	C-AL	470uF, 20%, 10V, -, -, 10x12.5, -
	2401-002075	C33, C35	C-AL	4.7uF, 20%, 50V, GP, TP, 5x11, 5
	2902-001011	BD1, BD101, BD102	FILTER-LINE	-, -, -

	SEC. Code	Location No.	Description	Spec
	2902-001011	BD103, BD151, BD152	FILTER-LINE	-, -, -
	3301-000344	FB1, FB2, FB3, FB4, FB5	CORE-FERRITE BEAD	ZZ, 3.5x6.5mm, -, -
	3602-000001	FH1, FH2, FH3, FH4	FUSE-CLIP	-, -, 30mohm
	JC39-40511A	JP104, JP105, JP106, JP107,	CBF HARNESS-	ML-80, JUMPER, AWG22, 52mm, SILVER
		JP108, JP109, JP110, JP111,		
		JP112, JP113, JP114, JP115,		
		JP116, JP117, JP118, JP119,		
		JP120, JP121, JP123, JP124,		
		JP125, JP126, JP127, JP128,		
		JP129, JP130, JP131, JP132,		
		JP133, JP134, JP135, JP136,		
		JP137, JP138, JP139, JP140,		
		JP141, JP142, JP142, JP143,		
		JP144, JP145, JP146, JP147,		
		JP148, JP149, JP150, JP151,		
		JP152, JP153, JP154, JP155,		
		JP156, JP157, JP158, JP159,		
		JP160, JP16, JP17, JP21, JP22,		
		JP23, JP161, JP162, JP163,		
		JP164, JP165, JP166, JP167,		
		JP168, JP169, JP170, JP171,		
		JP172, JP173, JP174, JP175,		
		JP176, JP177, JP178, JP179,		
		JP180, JP181, JP182, JP188,		
		JP189, JP190, JP191, JP192,		
		JP193, JP194, JP195, JP196,		
		JP197, JP198, JP199, JP200,		
		JP203, JP187, JP268, JP204,		
		JP205, JP206, JP208, JP209,		
		JP210, JP211, JP212, JP213,		
		JP214, JP217, JP218, JP219,		
		JP220, JP221, JP222, JP223,		
		JP224, JP225, JP226, JP227,		
		JP228, JP229, JP230, JP231,		
		JP232, JP233, JP234, JP25,		
		JP26, JP27, JP28, JP29, JP30,		
		JP31, JP216, JP272, JP273,		
		JP274, JP275, JP276, JP601,		
		JP38, JP39, JP40, JP41, JP42,		

	SEC. Code	Location No.	Description	Spec
	JC39-40511A	JP33, JP34, JP35, JP36, JP37,	CBF HARNESS-	ML-80, JUMPER, AWG22, 52mm, SILVER
		JP43, JP44, JP45, JP46, JP47,		
		JP49, JP50, JP51, JP52, JP55,		
		JP56, JP57, JP58, JP59, JP60,		
		JP62, JP63, JP602, JP605,		
		JP616, JP7, JP617, R412,		
		JP65, JP66, JP67, JP68, JP69,		
		JP70, JP71, JP72, JP73, JP74,		
		JP75, JP76, JP77, JP78, JP79,		
		JP80, JP8, JP10, JP11, JP13,		
		JP81, JP82, JP83, JP84, JP85,		
		JP86, JP87, JP88, JP89, JP90,		
		JP91, JP92, JP93, JP94, JP95,		
		JP96, JP97, JP98, JP99, JP100,		
		JP101, JP102, JP103, JS3, JS4,		
		JS5, JP4, JP5, JP6		
	JC41-10529A	-	PCB-ENGINE	ML-5500, FR-1, 1L, T1.6, 247X299mm
	0402-000104	DB101	DIODE-BRIDGE	D3SBA60, 600V, 4A, -, ST
	0502-000245	Q9	TR-POWER	KSB1151-Y, PNP, 1.3W, TO-126, -, 16
	0502-001124	Q201, Q202, Q203, Q204	TR-POWER	KSD526, NPN, 30W, TO-220, BK, 120-2
	0604-000142	PC152, PC153	PHOTO-COUPLER	TR, -, 200mW, DIP-4, ST
	0604-000146	PC151	PHOTO-COUPLER	TRIAC, -, 250mW, DIP-6, ST
	0604-001033	OP1, OP2, OP3, OP4	PHOTO-INTERRUPTER	TR, -, 150mW, DIP-4, ST
	0801-000528	U4	IC-CMOS LOGIC	74HCT574, D FLIP-FLOP, DIP, 20P, 3
	0801-000722	U6	IC-CMOS LOGIC	74HC245, TRANSCEIVER, DIP, 20P, 30
	0803-000679	U205	IC-TTL	7406, BUFFER/DRIVER, DIP, 14P, 300
	0803-001097	U203	IC-TTL	7407, BUFFER/DRIVER, DIP, 14P, 300
	0903-000219	U3	IC-MICROCOMPUTER	88C4316, 8BIT, DIP, 64P, -, 8MHz, ST
	1201-000229	U201	IC-OP AMP	324, DIP, 14P, 300MIL, QUAD, 100V/m
	1202-000103	U5	IC-VOLTAGE COMP.	393, DIP, 8P, 300MIL, DUAL, 36V, CMO
	1203-000258	U202	IC-POSI.FIXED REG.	7818, TO-220, 3P, -, PLASTIC, 17.3/
	1203-000531	U101	IC-SWITCH VOL. REG.	5311, DIP, 8P, 300MIL, PLASTIC, -, 3
	1404-000167	TH101	THERMISTOR-NTC	5ohm, 10%, 3150K, 18.7mW/C, TP
	1405-000147	TNR101	VARISTOR	470V, 4500A, 17x12mm, BK
	2003-000703	R157, R158	R-METAL OXIDE(S)	470ohm, 5%, 3W, AA, TP, 6x16mm
	2003-000706	R108	R-METAL OXIDE(S)	47Kohm, 5%, 2W, AA, TP, 4.3x12mm
	2009-001082	R280	R-METAL GLAZE	30Mohm, 2%, 2W, -, BK, 30x8.5mm
	2009-001083	R220	R-METAL GLAZE	200Mohm, 2%, 1/2W, CM, BK, 18x6mm
	2009-001084	R211	R-METAL GLAZE	30Mohm, 2%, 0.5W, CM, BK, 18x6mm

	SEC. Code	Location No.	Description	Spec
	2009-001085	R201	R-METAL GLAZE	10Mohm, 3%, 1/2W, CM, BK, 18x4mm
	2103-000156	VR201, VR202, VR204	VR-SEMI	10Kohm, 10%, 1/2W, TOP
	2103-000270	VR203	VR-SEMI	20Kohm, 10%, 1/2W, TOP
	2103-001079	VR205	VR-SEMI	100Kohm, 15%, 1/2W, TOP
	2201-000023	C103, C104, C115	C-CERAMIC, DISC	2.2nF, 20%, 125V, Y5U, TP, 11x7, 5
	2201-000154	C108	C-CERAMIC, DISC	10nF, +80-20%, 2KV, Y5P, TP, 20x5, 1
	2201-002066	C211, C212, C215, C216	C-CERAMIC, DISC	470pF, 10%, 6KV, Y5P, TP, 10x7, 10
	2201-002067	C213	C-CERAMIC, DISC	100pF, 10%, 6KV, Y5P, TP, 8x7, 10
	2306-000114	C102	C-FILM, MPPF	100nF, 20%, 250VAC, BK, 18x7.5mm, 1
	2401-000183	C156, C157	C-AL	1000uF, 20%, 35V, WT, TP, 12.5x25, 5
	2401-000697	C151	C-AL	2200uF, 20%, 16V, WT, TP, 12.5x25, 5
	2401-001691	C107	C-AL	150uF, 20%, 400V, WT, BK, 30x25, 10
	2501-000203	C101	C-PAPER	470nF, 0.2, 250VAC, TP, 26x11mm, 22
	2801-000002	X1	CRYSTAL-UNIT	6.94407MHz, 50ppm, 28-AAM, 20pF, 5
	3405-000125	SW151, SW152	SWITCH-MICRO	125V, 5A, 50gf, SPDT
	3601-000003	F151	FUSE-FERRULE	250V, 5A, FAST ACTING, GLASS, 20x5
	3601-000296	F101	FUSE-FERRULE	250V, 5A, TIME LAG, CERAMIC, 5x20m
	3704-000235	U2	SOCKET-IC	28P, DIP, SN, 2.54mm
	3711-000164	CN4	CONNECTOR-HEADER	1WALL, 2P, 1R, 2.5mm, STRAIGHT, SN
	3711-000217	CN101	CONNECTOR-HEADER	1WALL, 3P, 1R, 3.96mm, STRAIGHT, SN
	3711-000633	CN3	CONNECTOR-HEADER	BOX, 11P, 1R, 2mm, STRAIGHT, SN
	3711-000782	CN105	CONNECTOR-HEADER	BOX, 2P, 1R, 2.0mm, STRAIGHT, SN
	3711-000865	CN103	CONNECTOR-HEADER	BOX, 3P, 1R, 2mm, STRAIGHT, SN
	3711-001108	CN6	CONNECTOR-HEADER	BOX, 8P, 1R, 2mm, STRAIGHT, SN
	3711-002104	CN102	CONNECTOR-HEADER	1WALL, 2P, 1R, 7.92mm, STRAIGHT, SN
	3711-002410	CN104	CONNECTOR-HEADER	BOX, 10P, 2R, 2mm, STRAIGHT, SN
	3711-002653	CN7	CONNECTOR-HEADER	BOX, 3P, 1R, 2.5mm, STRAIGHT, SN
	3711-003204	CN5	CONNECTOR-HEADER	BOX, 24P, 2R, 2mm, STRAIGHT, SN
	3711-003205	CN2	CONNECTOR-HEADER	BOX, 4P, 1R, 2.0mm, STRAIGHT, SN
	3711-003969	CN8, CN10	CONNECTOR-HEADER	BOX, 2P, 1R, 2.5mm, STRAIGHT, SN
	JC26-20301B	T201	TRANS AF-	ML-80, -, 95MH
	JC26-20301B	T202, T204	TRANS AF-	ML-80, -, 95MH
	JC26-20301D	T101	TRANS AF-	ML-80, -, 0.32WIRE
	JC26-30506A	T203	TRANS POWER-THV	ML-7000, -, 57.5/1.3uH, 180mH
	JC27-40502A	L103	COIL CHOCK-68UH	ML5500, 68uH, 0.04ohm, 32T
	JC27-60101B	L152	COIL FILTER-	-, 9UH, -, -
	JC27-60101C	L151	COIL FILTER-	-, 6UH, -, -
	JC27-60501A	L101	COIL FILTER-LINE220V	ML5500, 13.0mH, 0.10ohm, -
	JC27-60503A	L102	COIL FILTER-3MH	ML5500, 3.0mH, 0.40ohm, 30T

	SEC. Code	Location No.	Description	Spec
	JC33-10501B	-	SOLENOID-6000	ML-6000, 24VDC, 72W, 57, 39X39X22,
	JC70-10909A	HP1, HP2, HP3, HP4	IPR-CONNECTOR HV	ML-80, AL, T0.8, -
	JC96-00319A	-	ELA HOU-H/SINK	ML-80(SEA), -, USA, -, -, -, -
	0402-000304	D153	DIODE-RECTIFIER	STPR1020CF, 200V, 5A, TO-220, ST
	0402-000314	D152	DIODE-RECTIFIER	D10SC4M, 40V, 10A, ITO-220
	0502-001124	Q201, Q203	TR-POWER	KSD526, NPN, 30W, TO-220, BK, 120-2
	0505-000173	Q102	FET-SILICON	SSP5N90, N, 900V, 5A, 2.5ohm, 150W,
	1401-000108	Q101	THYRISTOR-TRIAC	100A, 600V, -, 5V/uS, TO-220AB
	6003-000008	Q201, Q101	SCREW-TAPTITE	BH, +, S, M3, L4, ZPC3, SWRCH18A
	6003-000119	D152, D153, Q203	SCREW-TAPTITE	BH, +, B, M3, L8, CBLACK, SWRCH18A
	JC61-70100A	SMPS H/SINK	SPRING-PS	ML-66G, STS304-W1/2H, T0.5, -, -, -
	JC62-20001A	Q102	TUBE-IRF840	SSP5N90, IRF840, -, T0.45, L23, -
	JC62-30001A	Q102, D152, D153	HEAT SINK-TRANS	ML-80, AL, -
	JC62-30002A	Q203	HEAT SINK-SMPS	ML-80, AL, -
	JF62-30201A	Q101, Q201	HEAT SINK	HVPS, SPCC, t1.0
	JF68-30527H	-	LABEL(R)-BAR CODE	SF1000, PY, 38X6.5, T0.1, WHT
	JF68-30527N	-	LABEL(R)-BAR CODE	SF500, PY, 20X10, T0.1, WHT

7-2. Controller Board Parts Lists

7-2-1. Controller Board (Not for XEU)

	SEC. Code	Location No.	Description	Spec
	JC92-01089A		**Controller**	
	0803-000117	U35	IC-TTL	74F14, INVERTER, SOP, 14P, 150MIL,
	0803-000207	U36	IC-TTL	74F08, AND GATE, SOP, 14P, 150MIL,
	0803-000274	U34	IC-TTL	74F32, OR GATE, SOP, 14P, 150MIL, Q
	0803-003058	U33	IC-TTL	74F1071, ESD, SOP, 20P, -, -, TP, PLA
	0903-001126	U1	IC-MICROCONTROLLER	32C6100, 32BIT, QFP, 208P, -, 33MHz
	1103-000133	U12	IC-EEPROM	93C66, 256x16BIT, SOP, 8P, 150MIL,
	1105-000191	U3, U4	IC-DRAM	416C120, -, -, -, -, 70nS, 5V, -, -, 0t
	1107-001077	U31, U32	IC-FLASH MEMORY	29F800, 512Kx16BIT, SOP, 44P, 512M
	1203-000346	U30	IC-VOL. SUPERVISORY	7705, SOP, 8P, 150MIL, PLASTIC, 20V
	2007-000029	R290, R291, R185, R186, R175	R-CHIP	0OHM, 5%, 1/10W, DA, TP, 2012
	2007-000029	R99, R122, R123, R124, R159	R-CHIP	0OHM, 5%, 1/10W, DA, TP, 2012
	2007-000290	R125, R273, R274, R275,	R-CHIP	100OHM, 5%, 1/10W, DA, TP, 2012
		R276, R277, R278		
	2007-000300	R139, R267, R268, R269,	R-CHIP	10KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000300	R270, R271, R272, R298, R43,	R-CHIP	10KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000300	R44, R45, R46, R133, R134	R-CHIP	10KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000308	R34, R35, R55, R56, R57, R58	R-CHIP	10OHM, 5%, 1/10W, DA, TP, 2012
	2007-000308	R66, R67, R68, R69, R70, R71	R-CHIP	10OHM, 5%, 1/10W, DA, TP, 2012
	2007-000308	R72, R73, R74, R75, R76, R77	R-CHIP	10OHM, 5%, 1/10W, DA, TP, 2012
	2007-000308	R79, R80, R83, R131, R132,	R-CHIP	10OHM, 5%, 1/10W, DA, TP, 2012
		R143		
	2007-000449	R120	R-CHIP	180OHM, 5%, 1/10W, DA, TP, 2012
	2007-000468	R104, R105, R106, R107,	R-CHIP	1KOHM, 5%, 1/10W, DA, TP, 2012
		R108, R114, R115, R116,		
		R130, R140, R149, R53, R97,		
		R98, R101, R102, R103		
	2007-000493	R129	R-CHIP	2.2KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000686	R265, R266	R-CHIP	3.3KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000781	R150, R153, R154, R144	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
	2007-000781	R36, R37, R38, R39, R40, R59	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
	2007-000781	R87, R88, R89, R90, R91, R92	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
	2007-000781	R93, R94, R127, R128, R142,	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
	2007-000931	R42	R-CHIP	470OHM, 5%, 1/10W, DA, TP, 2012
	2007-000964	R109, R110, R111, R112,	R-CHIP	5.1KOHM, 5%, 1/10W, DA, TP, 2012

	SEC. Code	Location No.	Description	Spec
	2007-000964	R113, R264	R-CHIP	5.1KOHM, 5%, 1/10W, DA, TP, 2012
	2007-001133	R33, R84, R126	R-CHIP	68OHM, 5%, 1/10W, DA, TP, 2012
	2011-001094	RA1, RA2, RA3, RA4, RA5,	R-NETWORK	39ohm, 5%, 1/16W, L, CHIP, 8P, TP
		RA6		
	2011-001094	RA13, RA14	R-NETWORK	39ohm, 5%, 1/16W, L, CHIP, 8P, TP
	2011-001094	RA7, RA8, RA9, RA10,	R-NETWORK	39ohm, 5%, 1/16W, L, CHIP, 8P, TP
		RA11, RA12		
	2203-000192	C12, C13, C14, C15, C16	C-CERAMIC, CHIP	100nF, +80-20%, 50V, Y5V, TP, 2012,
	2203-000192	C160, C177, C181, C182,	C-CERAMIC, CHIP	100nF, +80-20%, 50V, Y5V, TP, 2012,
		C183, C184, C17, C18, C19,		
		C20, C21, C22, C185, C186,		
		C187, C188, C189, C192,		
		C23, C24, C25, C32, C33,		
		C34, C35, C36, C37, C42,		
		C46, C47, C355, C6, C7, C8,		
		C9, C10, C11		
	2203-000239	C128, C129, C130, C163,	C-CERAMIC, CHIP	100pF, 5%, 50V, NPO, TP, 2012, -
		C164, C168, C169, C170,		
		C171, C172, C173, C174,		
		C175, C176, C178, C179,		
		C180, C320		
	2203-000260	C161	C-CERAMIC, CHIP	10nF, 10%, 50V, X7R, TP, 2012, -
	2203-000429	C51, C52, C53, C54, C55,	C-CERAMIC, CHIP	18pF, 5%, 50V, NPO, TP, 2012, -
		C56, C57, C58, C59, C60,		
		C61, C62, C63, C64, C65,		
		C66, C67, C68, C69, C70,		
		C71, C72, C73, C74, C75,		
		C76, C77, C78, C79, C80,		
		C81, C82, C83, C84, C85,		
		C167		
	2203-000444	C139, C144, C145, C146,	C-CERAMIC, CHIP	1nF, 10%, 50V, X7R, TP, 2012, -
		C147, C359		
	2203-000455	C348, C349, C350, C351,	C-CERAMIC, CHIP	1nF, 5%, 50V, NPO, TP, 2012, -
		C352		
	2203-000595	C301	C-CERAMIC, CHIP	220pF, 5%, 50V, NPO, TP, 2012, -
	2203-000634	C108, C109, C110, C111,	C-CERAMIC, CHIP	22pF, 5%, 50V, NPO, TP, 2012, -
		C112, C120, C157, C158,		
		C165, C166, C190		
	2203-000938	C341, C342, C343, C344,	C-CERAMIC, CHIP	470pF, 5%, 50V, NPO, TP, 2012, -

	SEC. Code	Location No.	Description	Spec
	2203-000938	C345, C346, C347	C-CERAMIC, CHIP	470pF, 5%, 50V, NPO, TP, 2012, -
	2203-001002	C104, C105, C107, C113	C-CERAMIC, CHIP	47pF, 5%, 50V, NPO, TP, 2012, -
	2203-001158	C48, C50	C-CERAMIC, CHIP	68pF, 5%, 50V, NPO, TP, 2012, -
	2404-000128	C162	C-TA, CHIP	10uF, 20%, 16V, -, TP, 6032, -
	2404-000308	C1, C2, C3, C191	C-TA, CHIP	33uF, 20%, 10V, -, TP, 7342, 4.4mm
	2404-000308	C340	C-TA, CHIP	33uF, 20%, 10V, -, TP, 7342, 4.4mm
	2804-000349	OSC1	OSCILLATOR-CLOCK	66MHz, 100ppm, 10 TTL, BK, 5V, 45mA
	2804-001230	OSC2	OSCILLATOR-CLOCK	47.7789MHz, 50ppm, 10TTL & CMOS,
	2901-000229	LF1, LF2, LF3, LF4, LF5	FILTER-EMI SMD	50V, 300mA, -, 22nF, 4.5x1.8x3.2mm
	2901-000235	LF6, LF10	FILTER-EMI SMD	50V, 300mA, -, 150pF, 4.5x1.8x3.2,
	3301-001074	B7, B113, B114, BD1, R96	CORE-FERRITE BEAD	AB, 2.0x1.25x0.9mm, -, -
	3702-000118	J1	CONNECTOR-RIBBON	36P, FEMALE, ANGLE, AU
	3709-000177	J7	CONNECTOR-CARD EDGE	72P, 1.27mm, ANGLE, SN
	3711-001091	J2	CONNECTOR-HEADER	BOX, 7P, 1R, 2.5mm, STRAIGHT, SN
	3711-003204	J5	CONNECTOR-HEADER	BOX, 24P, 2R, 2mm, STRAIGHT, SN
	3711-003205	J11	CONNECTOR-HEADER	BOX, 4P, 1R, 2.0mm, STRAIGHT, SN
	4701-001020	U29	FREQ-ATTENUATOR	5-80MHz, 15dB, -, 0.03W
	JC11-10507A	U28	IC MASK ROM-HIGH	ML-165, KM23C8105DG, SOP, 44P, 600
	JC11-10510A	U27	IC MASK ROM-PCL6, LOW	ml-165, KM23C8105DG, SOP, 44P, 600
	JC41-00003A	PCB-6050	PCB—CONTROLLER	ML-6050, FR-4, 4, 1.6, 192.5*145

7-2-2. Controller Board (Only XEU)

	SEC. Code	Location No.	Description	Spec
	JC92-01089B		**Controller**	
	0803-000117	U35	IC-TTL	74F14, INVERTER, SOP, 14P, 150MIL,
	0803-000117	U39	IC-TTL	74F14, INVERTER, SOP, 14P, 150MIL,
	0803-000207	U36	IC-TTL	74F08, AND GATE, SOP, 14P, 150MIL,
	0803-000274	U34	IC-TTL	74F32, OR GATE, SOP, 14P, 150MIL, Q
	0803-000303	U41	IC-TTL	74F74, D FLIP-FLOP, SOP, 14P, 150M
	0803-003058	U33	IC-TTL	74F1071, ESD, SOP, 20P, -, -, TP, PLA
	0903-001126	U1	IC-MICROCONTROLLER	32C6100, 32BIT, QFP, 208P, -, 33MHz
	1103-000133	U12	IC-EEPROM	93C66, 256x16BIT, SOP, 8P, 150MIL,
	1105-000191	U3, U4	IC-DRAM	416C120, -, -, -, -, 70nS, 5V, -, -, 0t
	1107-001077	U31, U32	IC-FLASH MEMORY	29F800, 512Kx16BIT, SOP, 44P, 512M
	1203-000346	U30	IC-VOL. SUPERVISORY	7705, SOP, 8P, 150MIL, PLASTIC, 20V
	2007-000029	R290, R291, R99	R-CHIP	0OHM, 5%, 1/10W, DA, TP, 2012
	2007-000029	R122, R123, R124, R159	R-CHIP	0OHM, 5%, 1/10W, DA, TP, 2012
	2007-000290	R125, R273, R274, R275,	R-CHIP	100OHM, 5%, 1/10W, DA, TP, 2012
	2007-000290	R276, R277, R278	R-CHIP	100OHM, 5%, 1/10W, DA, TP, 2012
	2007-000300	R139, R174, R267, R268	R-CHIP	10KOHM, 5%, 1/10W, DA, TP, 2012
		R269, R270, R271, R272,		
		R298, R43, R44, R45, R46,		
		R133, R134		
	2007-000308	R34, R35, R55, R56, R57,	R-CHIP	10OHM, 5%, 1/10W, DA, TP, 2012
		R58, R66, R67, R68, R69,		
		R70, R71, R72, R73, R74,		
		R75, R76, R77, R79, R80,		
		R83, R131, R132, R143		
	2007-000449	R120	R-CHIP	180OHM, 5%, 1/10W, DA, TP, 2012
	2007-000468	R104, R105, R106, R107,	R-CHIP	1KOHM, 5%, 1/10W, DA, TP, 2012
		R108, R114, R115, R116,		
		R130, R140, R149, R296,		
		R53, R97, R98, R101, R102,		
		R103		
	2007-000493	R129	R-CHIP	2.2KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000686	R265, R266	R-CHIP	3.3KOHM, 5%, 1/10W, DA, TP, 2012
	2007-000781	R150, R153, R154, R168,	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
		R36, R37, R38, R39, R40,		
		R59, R87, R88, R89, R90,		
		R91, R92, R93, R94, R127,		

	SEC. Code	Location No.	Description	Spec
	2007-000781	R128, R142, R144	R-CHIP	33OHM, 5%, 1/10W, DA, TP, 2012
	2007-000931	R42	R-CHIP	470OHM, 5%, 1/10W, DA, TP, 2012
	2007-000964	R109, R110, R111, R112,	R-CHIP	5.1KOHM, 5%, 1/10W, DA, TP, 2012
		R113, R264		
	2007-001133	R33, R84, R126	R-CHIP	68OHM, 5%, 1/10W, DA, TP, 2012
	2011-001094	RA1, RA2, RA3, RA4, RA5,	R-NETWORK	39ohm, 5%, 1/16W, L, CHIP, 8P, TP
		RA6, RA13, RA14, RA7, RA8,		
		RA9, RA10, RA11, RA12		
	2203-000192	C12, C13, C14, C15, C16	C-CERAMIC, CHIP	100nF, +80-20%, 50V, Y5V, TP, 2012,
		C160, C177, C181, C182,		
		C183, C184, C17, C18, C19,		
		C20, C21, C22, C185, C186,		
		C187, C188, C189, C192, C23,		
		C24, C25, C32, C33, C34,		
		C323, C324, C325, C326,		
		C327, C328, C329, C331,		
		C332, C333, C334, C335,		
		C337, C338, C339, C355,		
		C35, C36, C37, C42, C46,		
		C47, C358, C6, C7, C8, C9,		
		C10, C11		
	2203-000239	C128, C129, C130, C163,	C-CERAMIC, CHIP	100pF, 5%, 50V, NPO, TP, 2012, -
		C164, C168, C169, C170,		
		C171, C172, C173, C174,		
		C175, C176, C178, C179,		
		C180, C320		
	2203-000260	C161	C-CERAMIC, CHIP	10nF, 10%, 50V, X7R, TP, 2012, -
	2203-000429	C363, C51, C52, C53, C54,	C-CERAMIC, CHIP	18pF, 5%, 50V, NPO, TP, 2012, -
		C55, C56, C57, C58, C59,		
		C60, C61, C62, C63, C64,		
		C65, C66, C67, C68, C69,		
		C70, C71, C72, C73, C74,		
		C75, C76, C77, C78, C79,		
		C80, C81, C82, C83, C84,		
		C85, C167		
	2203-000444	C139, C144, C145, C146,	C-CERAMIC, CHIP	1nF, 10%, 50V, X7R, TP, 2012, -
		C147, C359		
	2203-000455	C348, C349, C350, C351,	C-CERAMIC, CHIP	1nF, 5%, 50V, NPO, TP, 2012, -
		C352, C366, C367, C368		

	SEC. Code	Location No.	Description	Spec
	2203-000595	C301	C-CERAMIC, CHIP	220pF, 5%, 50V, NPO, TP, 2012, -
	2203-000634	C108, C109, C110, C111,	C-CERAMIC, CHIP	22pF, 5%, 50V, NPO, TP, 2012, -
	2203-000634	C112, C120, C157, C158,	C-CERAMIC, CHIP	22pF, 5%, 50V, NPO, TP, 2012, -
		C165, C166, C190, C314		
	2203-000938	C341, C342, C343, C344,	C-CERAMIC, CHIP	470pF, 5%, 50V, NPO, TP, 2012, -
		C345, C346, C347		
	2203-001002	C104, C105, C107, C113	C-CERAMIC, CHIP	47pF, 5%, 50V, NPO, TP, 2012, -
	2203-001158	C48, C50, C306	C-CERAMIC, CHIP	68pF, 5%, 50V, NPO, TP, 2012, -
	2404-000128	C162	C-TA, CHIP	10uF, 20%, 16V, -, TP, 6032, -
	2404-000308	C1, C2, C3, C191	C-TA, CHIP	33uF, 20%, 10V, -, TP, 7342, 4.4mm
	2404-000308	C304, C340	C-TA, CHIP	33uF, 20%, 10V, -, TP, 7342, 4.4mm
	2804-000349	OSC1	OSCILLATOR-CLOCK	66MHz, 100ppm, 10 TTL, BK, 5V, 45mA
	2804-001230	OSC2	OSCILLATOR-CLOCK	47.7789MHz, 50ppm, 10TTL & CMOS,
	2901-000229	LF1, LF2, LF3, LF4, LF5	FILTER-EMI SMD	50V, 300mA, -, 22nF, 4.5x1.8x3.2mm
	2901-000229	LF9	FILTER-EMI SMD	50V, 300mA, -, 22nF, 4.5x1.8x3.2mm
	2901-000235	LF6, LF10	FILTER-EMI SMD	50V, 300mA, -, 150pF, 4.5x1.8x3.2,
	3301-001074	B5, B6, R96	CORE-FERRITE BEAD	AB, 2.0x1.25x0.9mm, -, -
	3301-001074	B7, B8, B113, B114, BD1	CORE-FERRITE BEAD	AB, 2.0x1.25x0.9mm, -, -
	3702-000118	J1	CONNECTOR-RIBBON	36P, FEMALE, ANGLE, AU
	3709-000177	J7	CONNECTOR-CARD EDGE	72P, 1.27mm, ANGLE, SN
	3711-001091	J2	CONNECTOR-HEADER	BOX, 7P, 1R, 2.5mm, STRAIGHT, SN
	3711-003204	J5	CONNECTOR-HEADER	BOX, 24P, 2R, 2mm, STRAIGHT, SN
	3711-003205	J11	CONNECTOR-HEADER	BOX, 4P, 1R, 2.0mm, STRAIGHT, SN
	4701-001020	U29	FREQ-ATTENUATOR	5-80MHz, 15dB, -, 0.03W
	JC11-10507A	U28	IC MASK ROM-HIGH	ML-165, KM23C8105DG, SOP, 44P, 600
	JC11-10510A	U27	IC MASK ROM-PCL6, LOW	ml-165, KM23C8105DG, SOP, 44P, 600
	JC13-10506A	U40	IC ASIC-RET, GRAY	ML-165, HYPER CHIP, PQFP, 100P, 14
	JC41-00003A	PCB-6050	PCB—CONTROLLER	ML-6050, FR-4, 4, 1.6, 192.5*145

7-3. LED PANNEL Parts Lists

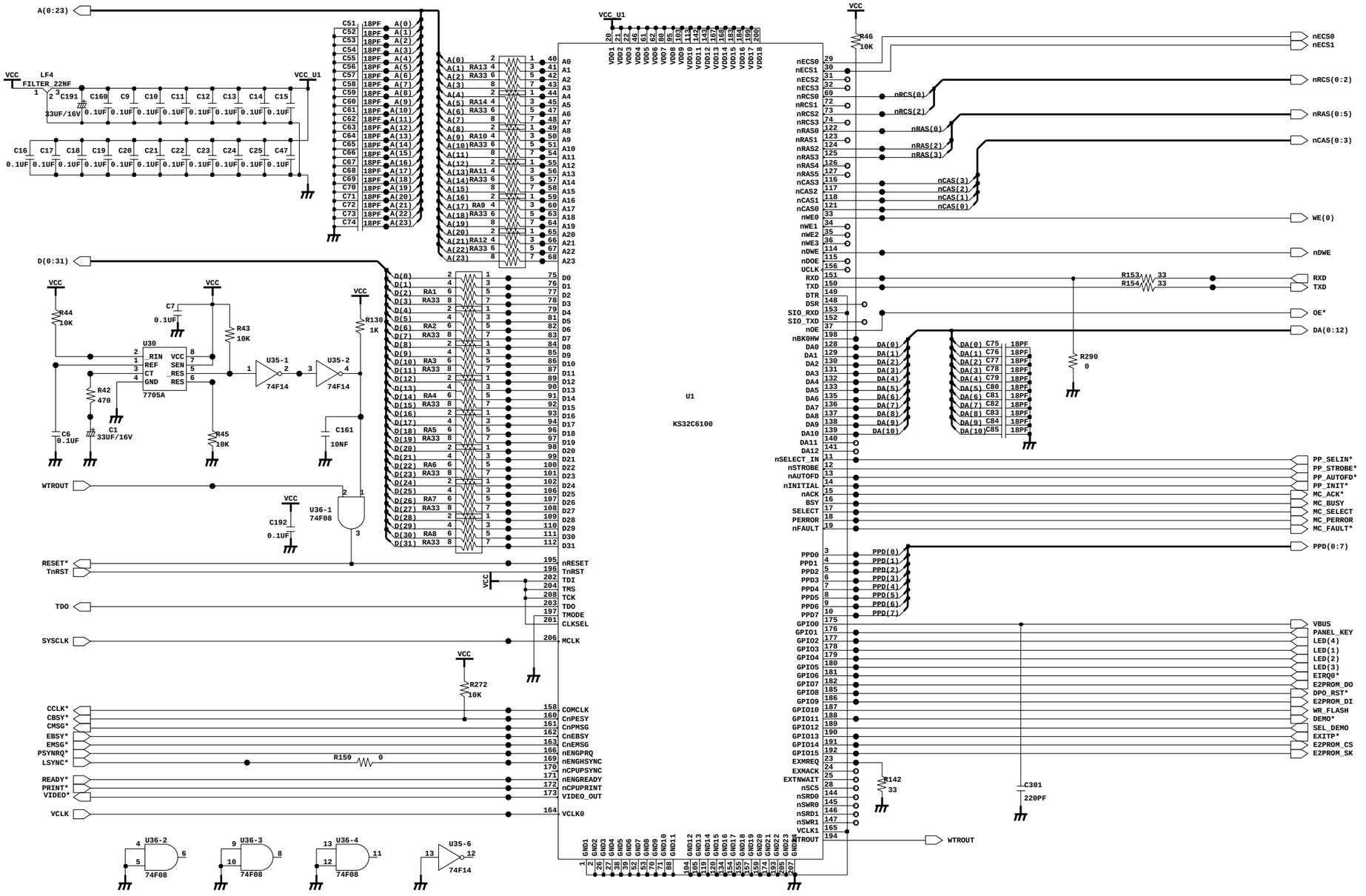
	SEC. Code	Location No.	Description	Spec
	JC92-00346A		**BPA-PANEL**	
	0601-000161	LED1	LED	ROUND,GRN,5mm,563nm
	0601-000255	LED4	LED	ROUND,RED,5mm,700nm
	0601-000304	LED2, LED3	LED	ROUND,YEL,5mm,585nm
	2001-000032	R1, R2, R3, R4	R-CARBON	180OHM,5%,1/4W,AA,TP,-
	2202-000579	C1	C-CERAMIC,MLC-AXIAL	100nF,+80-20%,50V,Z5U,TP,2.5x4
	3404-000116	SW1	SWITCH-TACT	12V,50mA,160gf,6X6X3.6mm,SPST
	3711-001096	J1	CONNECTOR-HEADER	BOX,7P,1R,2.5mm,ANGLE,SN
	JC41-10003A	-	PCB-PANEL LED	ML-85/84,FR-4,2L,1.6T,47X71

7-4. PTL Board Parts Lists

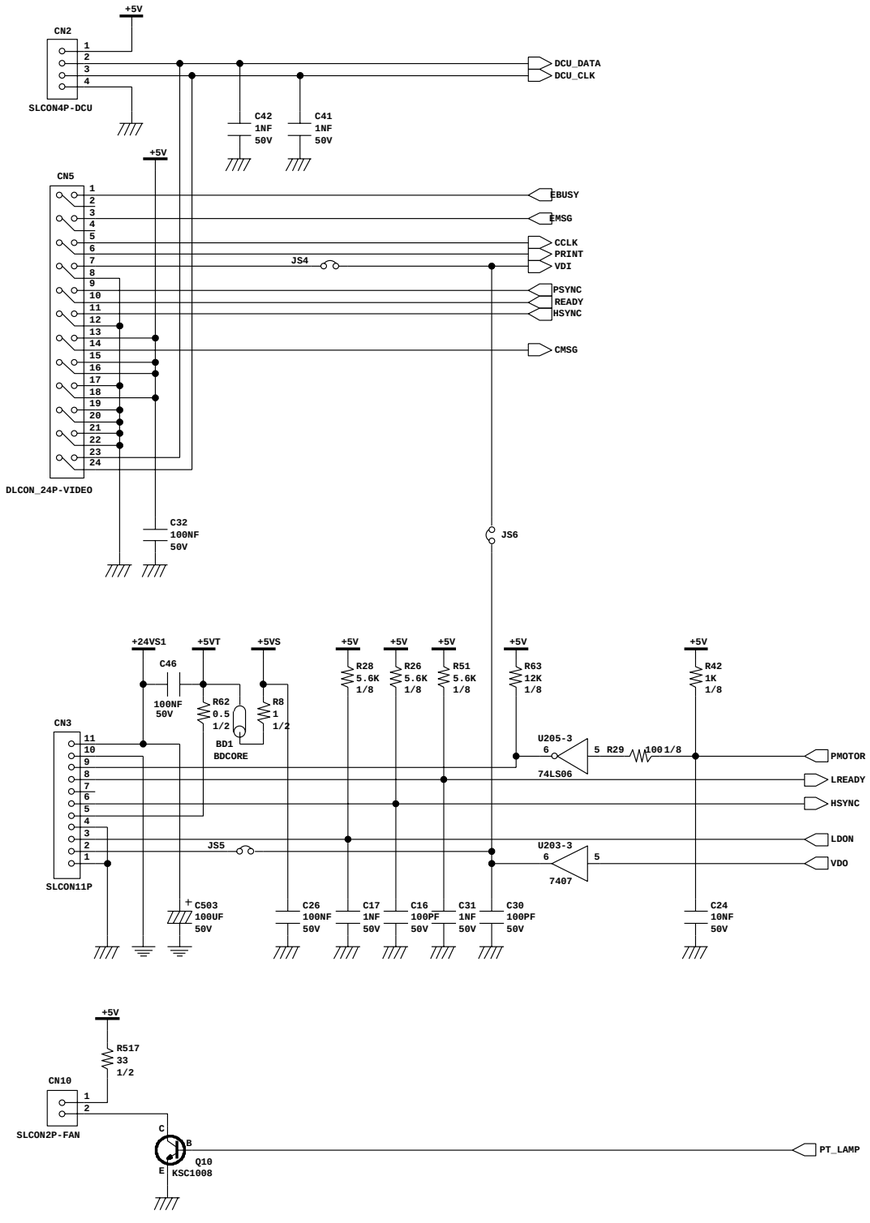
	SEC. Code	Location No.	Description	Spec
	JC92-01050A		**PTL**	
	0601-001244	LD1, LD2, LD3, LD4, LD5, LD6, LD7, LD8, LD9, LD10	LED	ROUND, RED, 3mm, 690nm
	0601-001244	LD11, LD12, LD13, LD14, LD15, LD16, LD17, LD18	LED	ROUND, RED, 3mm, 690nm
	JC41-10530A	-	PCB-PTL	ML-5500, FRI, 1L, T1.6, 218X8.5

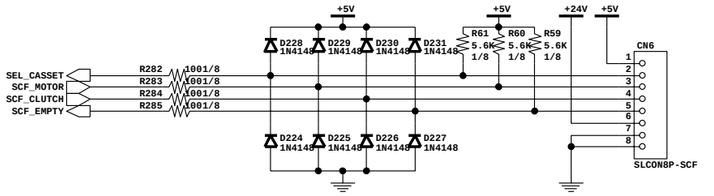
8. Schematic Diagrams

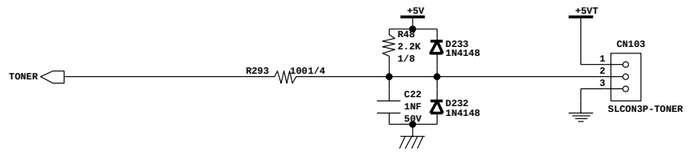
8-1. Engine Controller (1/6)

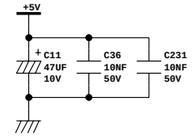


Engine Controller (2/6)

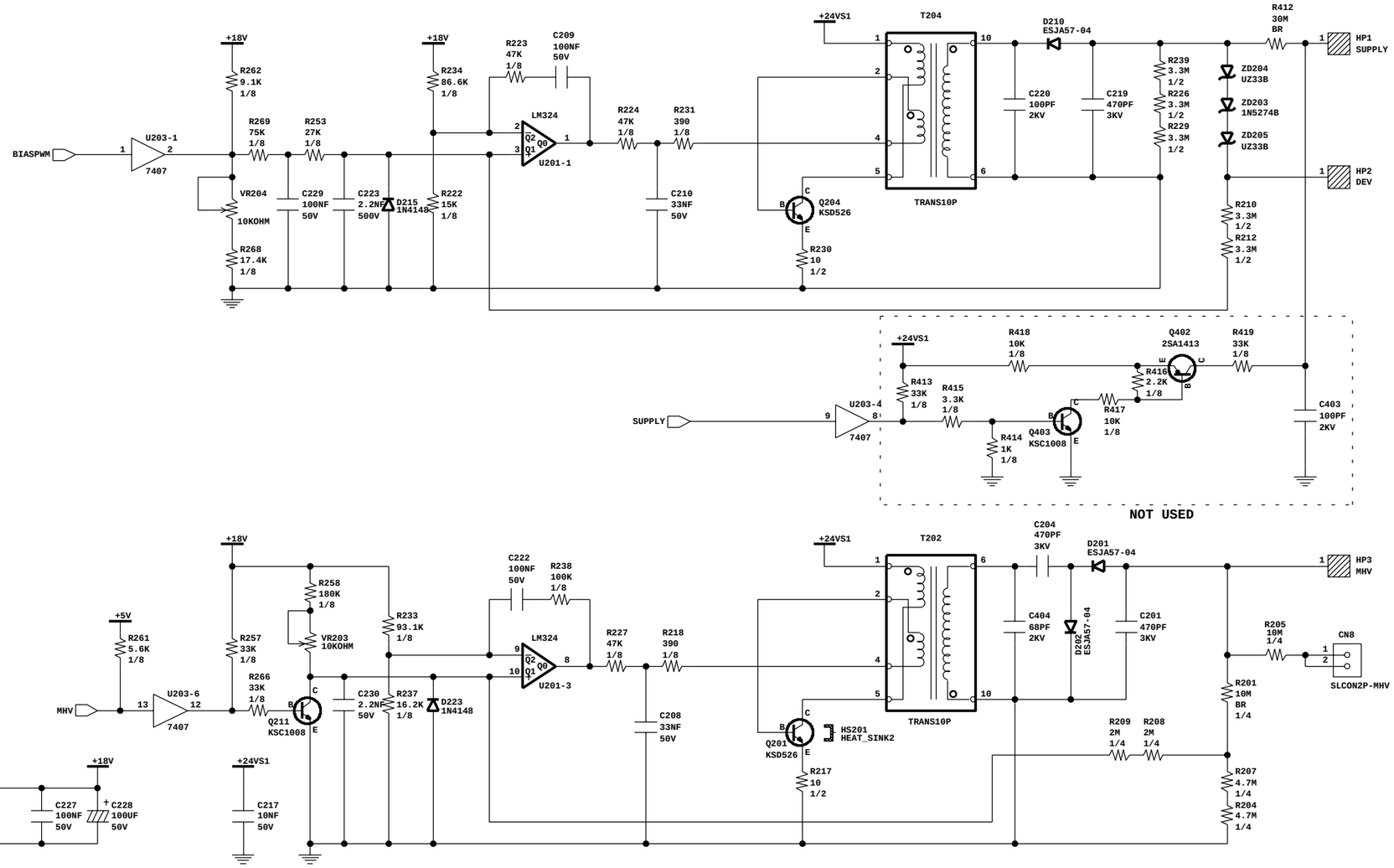




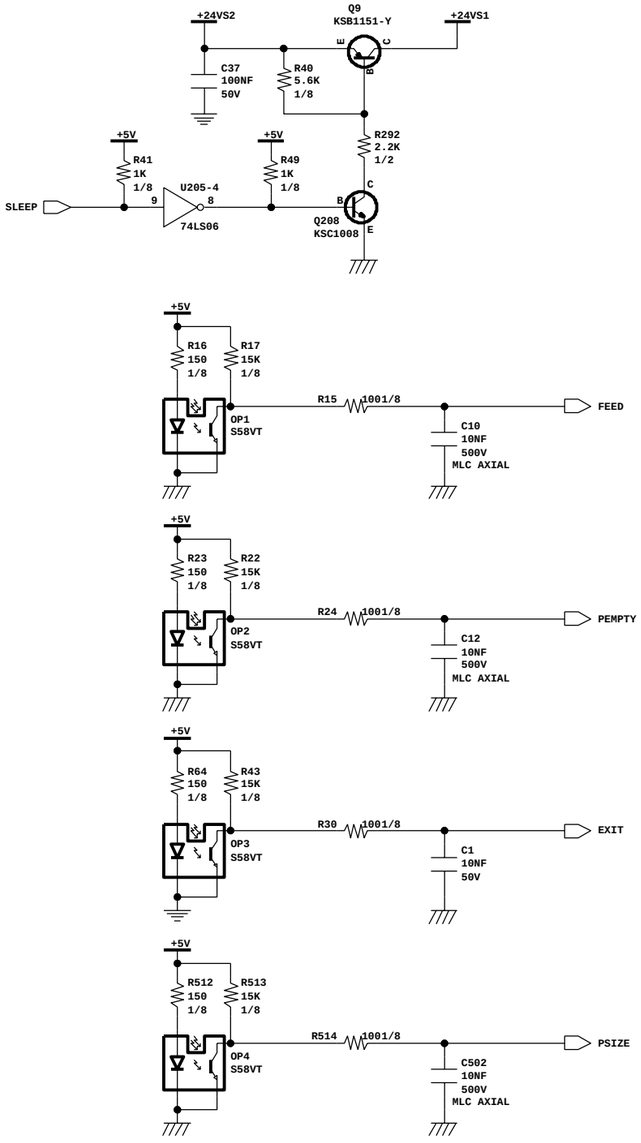


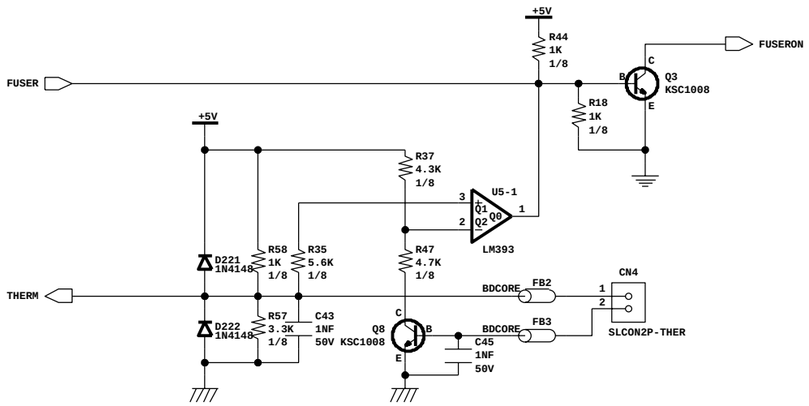


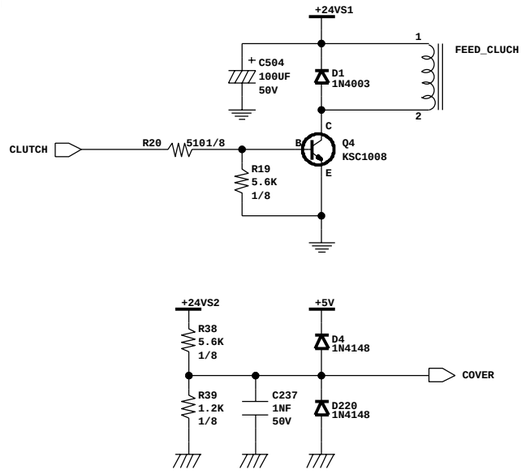
Engine Controller (3/6)

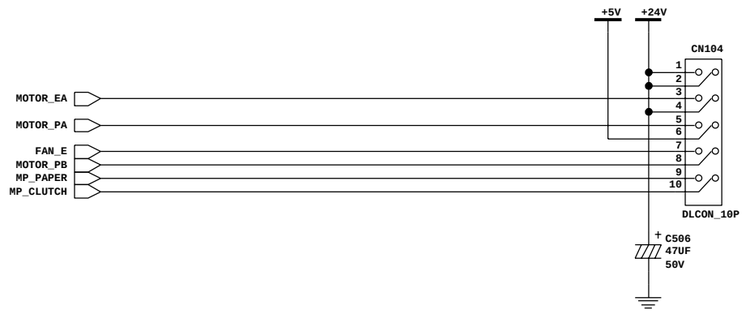


Engine Controller (4/6)

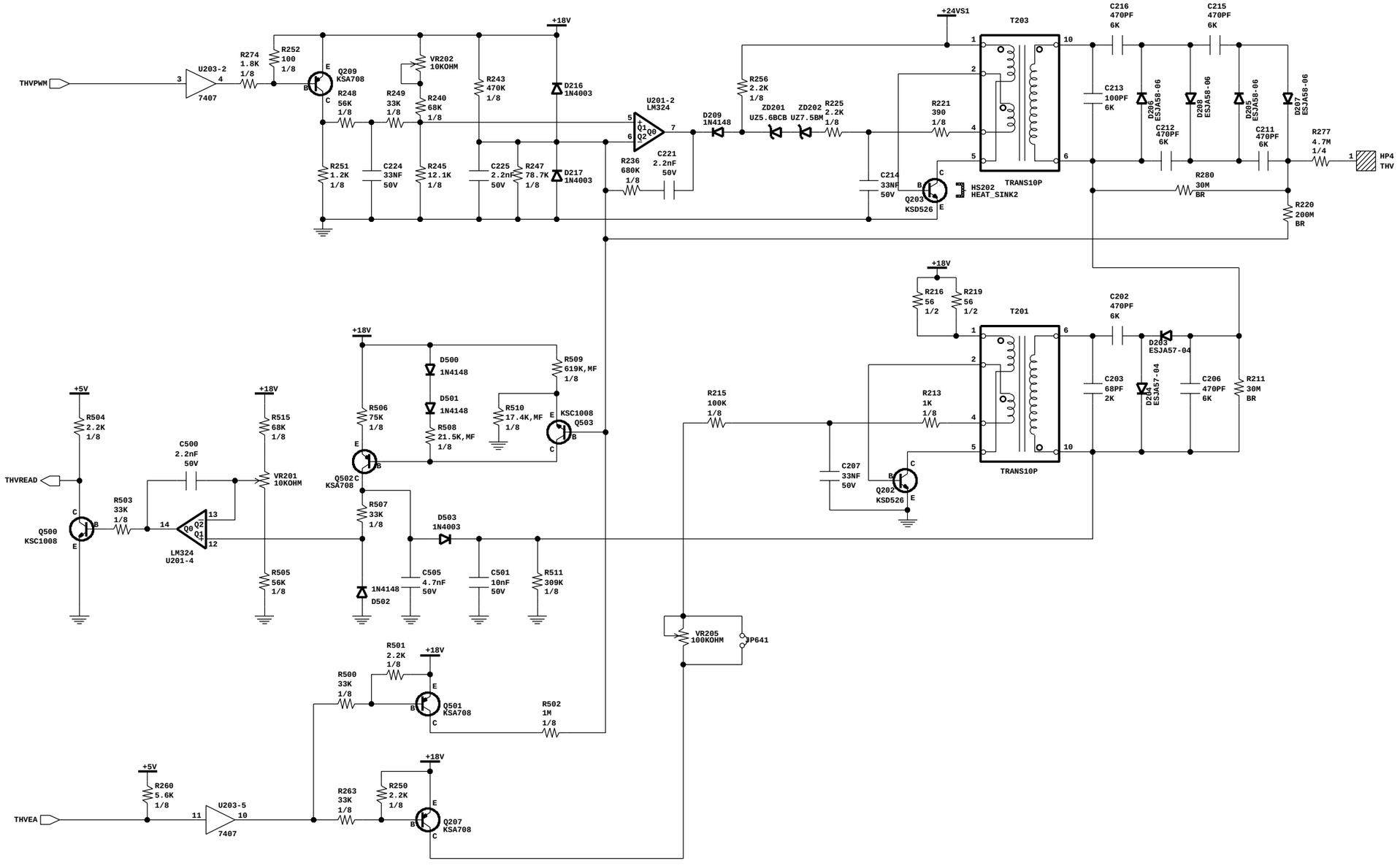




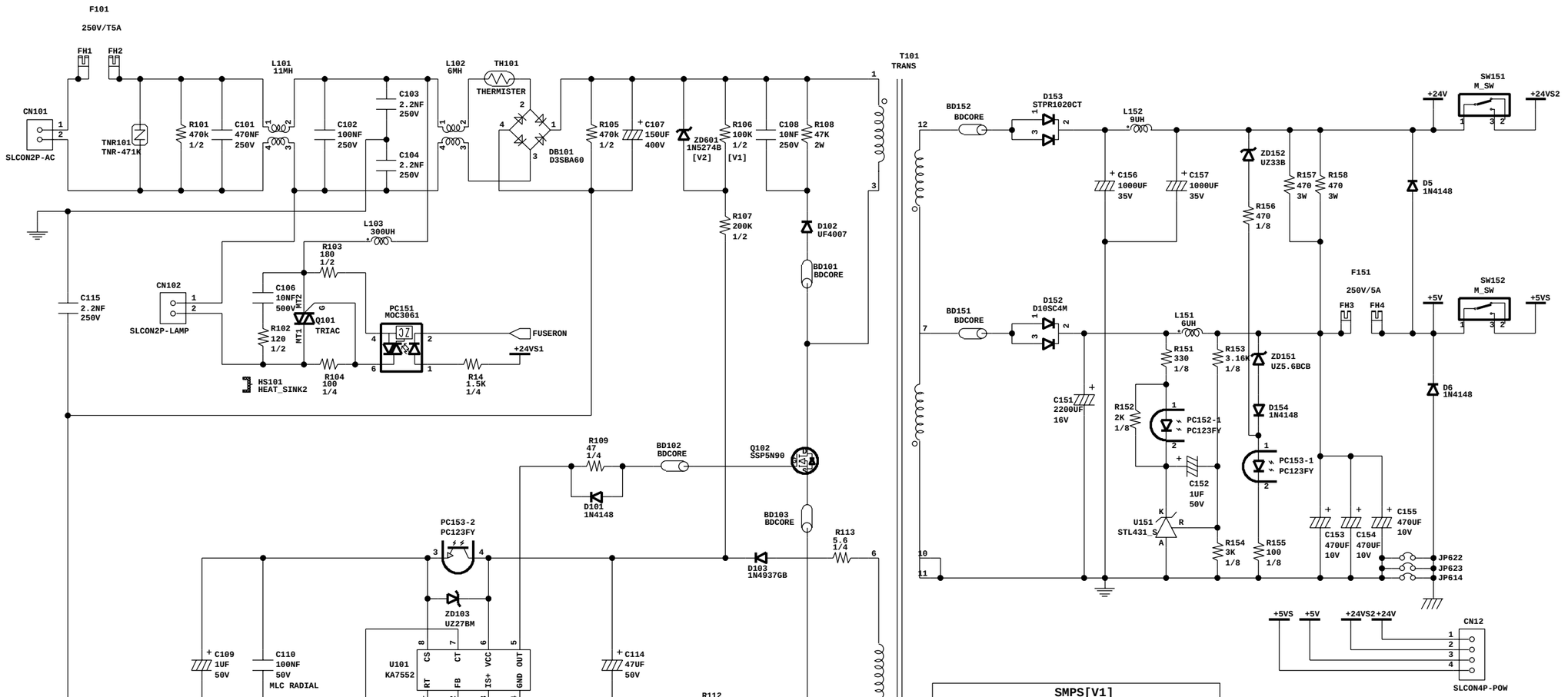




Engine Controller (5/6)

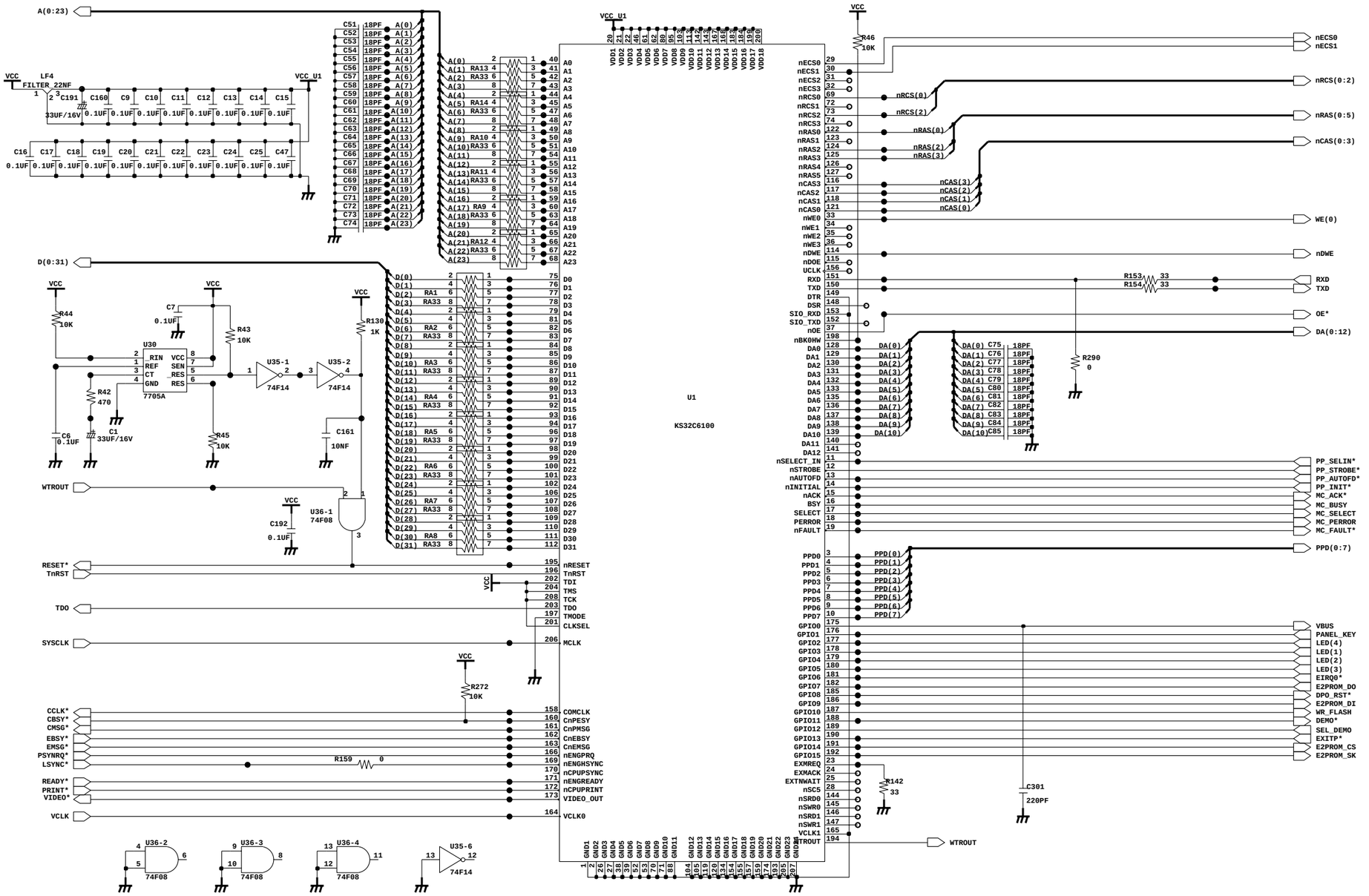


Engine Controller (6/6)

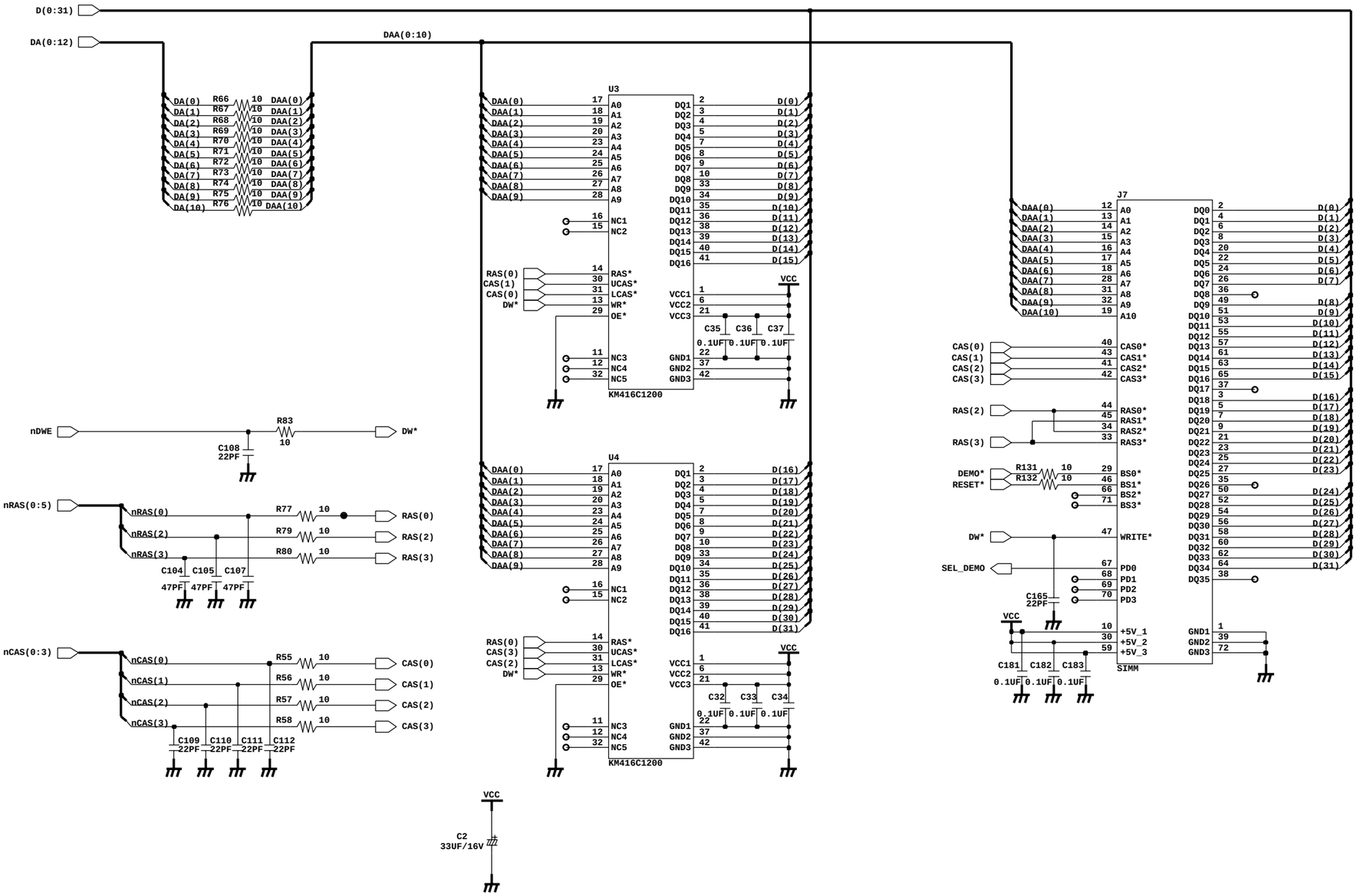


SMPS[V1]		
NO	LOCATION	DESCRIPTION
1	C101	220NF,250V
2	C102	47NF,250V
3	C107	220UF,200V
4	F101	125V/8A
5	F151	125V/5A
6	PC152,PC153	PC817
7	Q102	IRF840
8	T101	1900UH
9	R114	0.1OHM,2W
10	R106,R107	100KOHM,1/2W

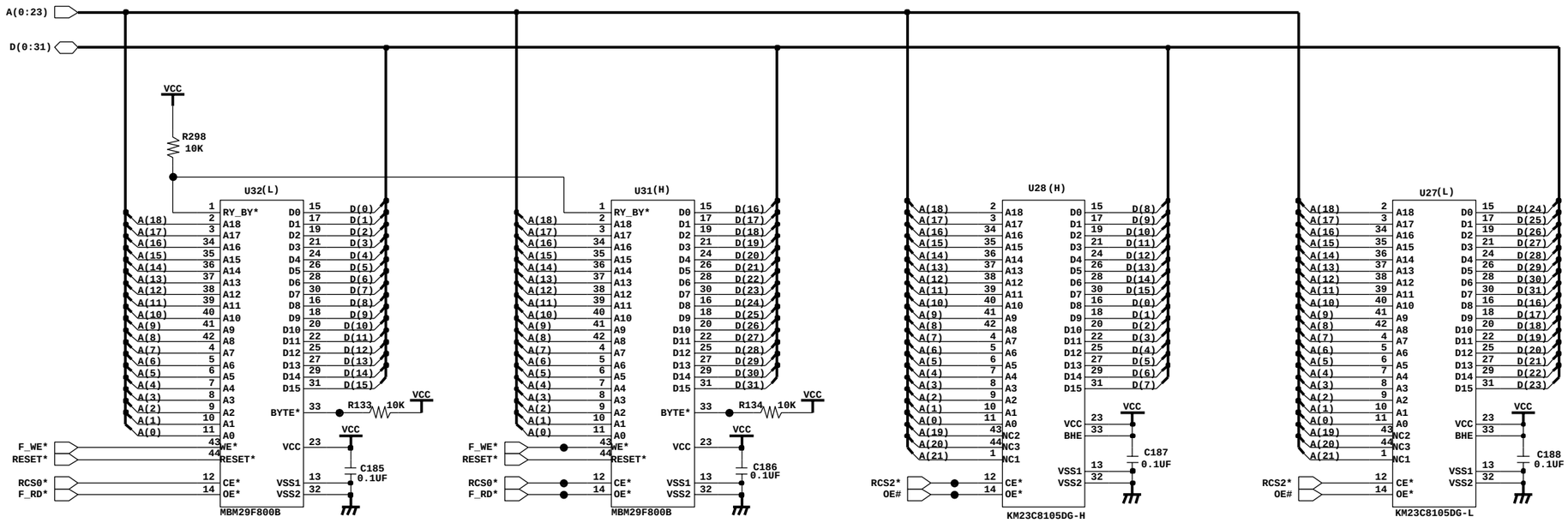
8-2. Controller Diagram(1/10)

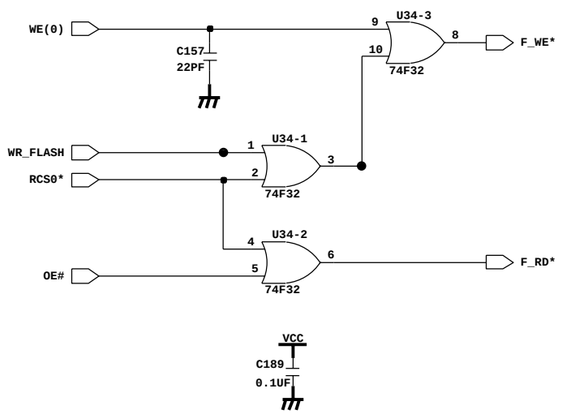


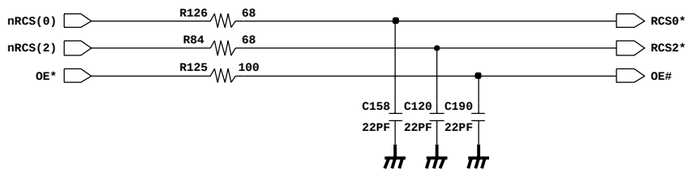
Controller Diagram(2/10)



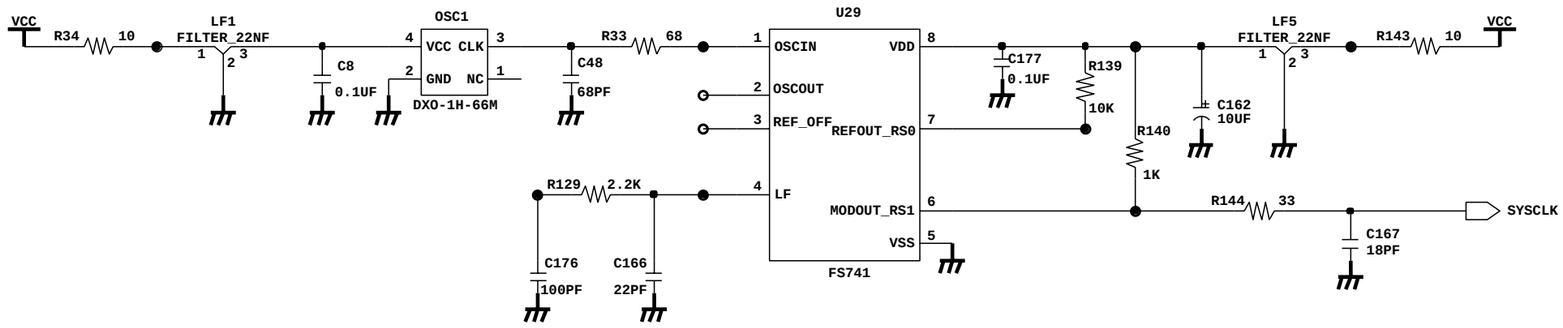
Controller Diagram(3/10)



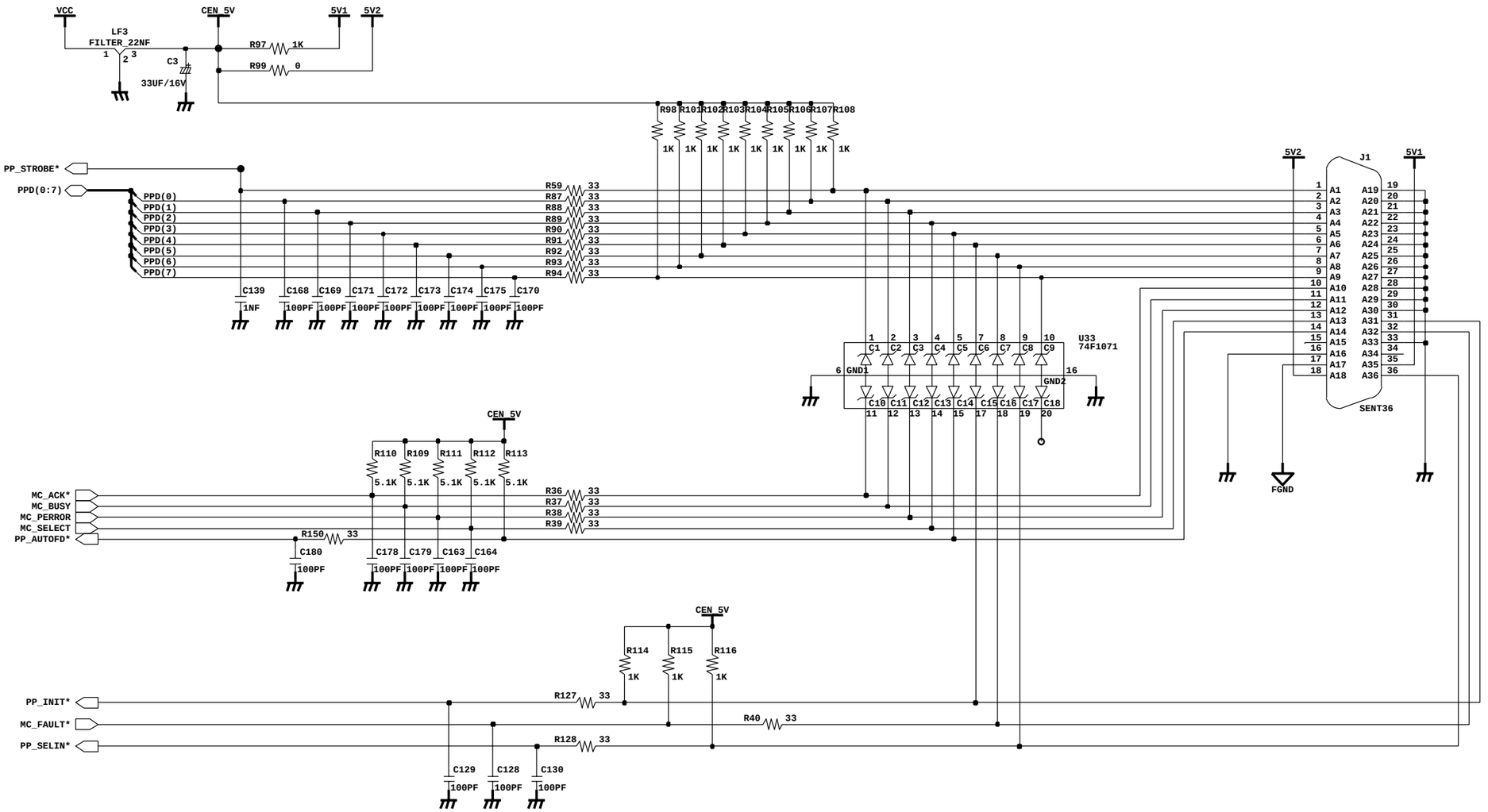




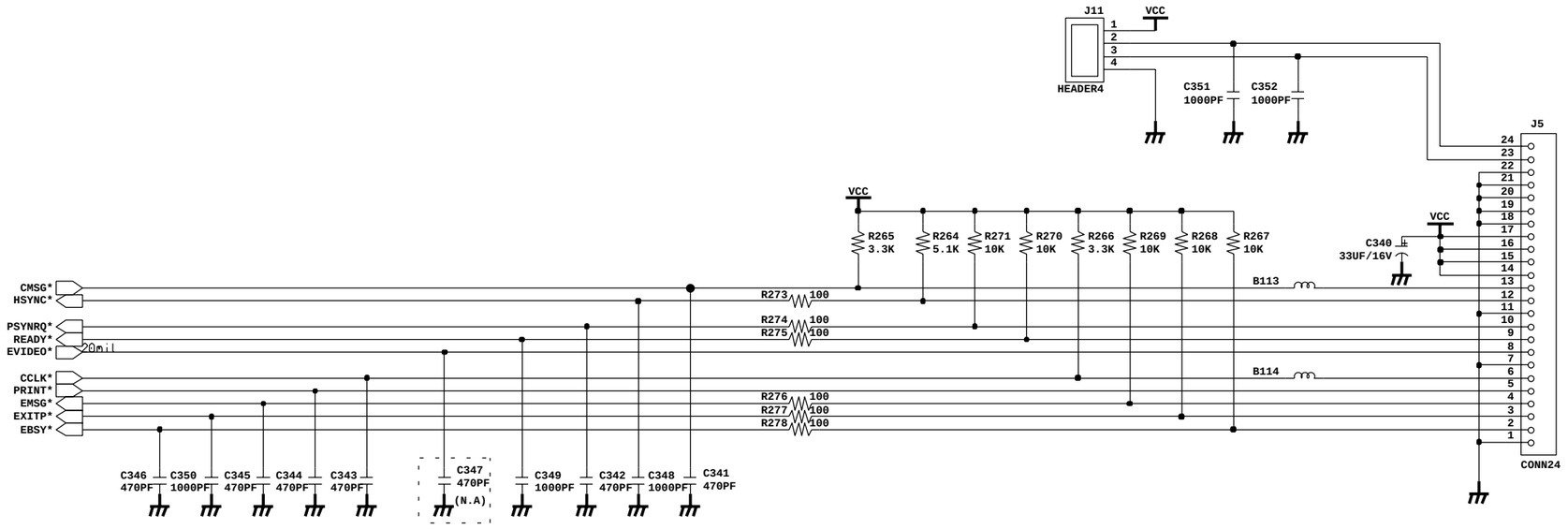
Controller Diagram(4/10)



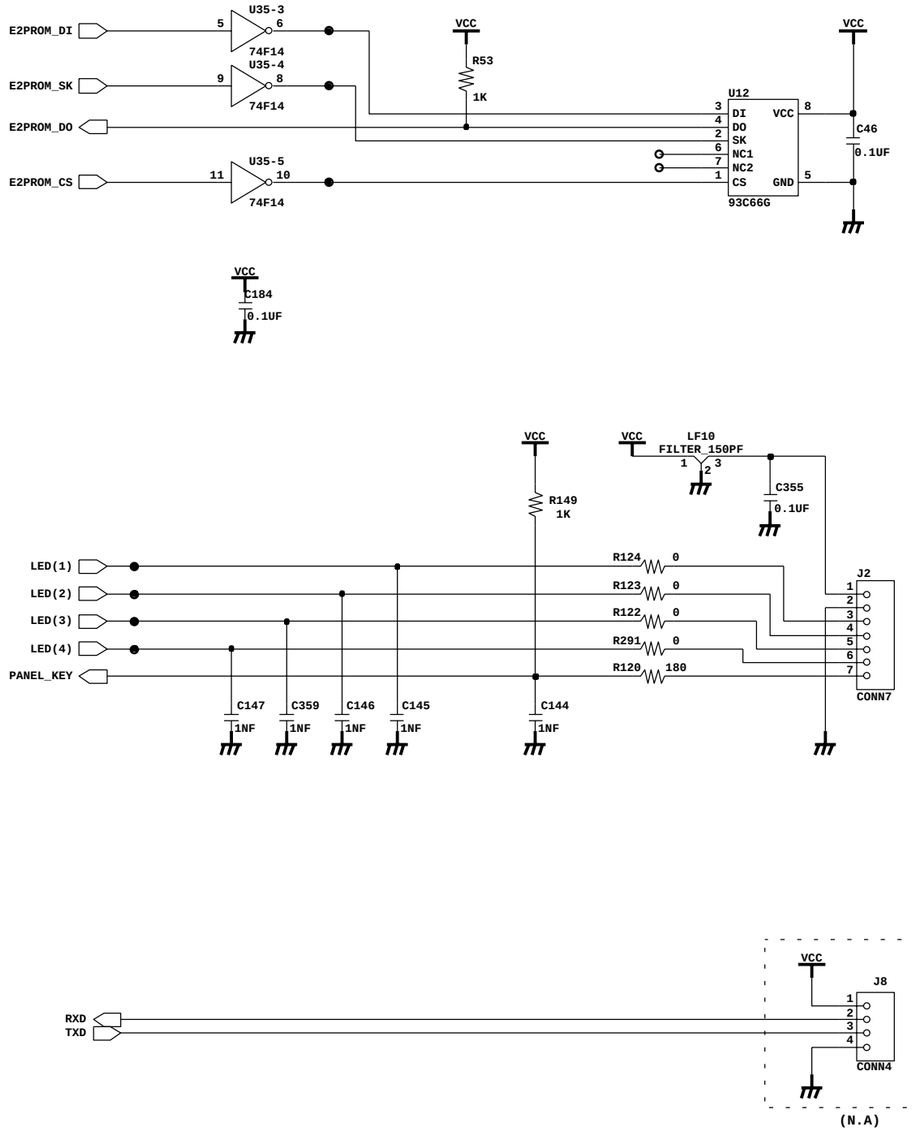
Controller Diagram(5/10)



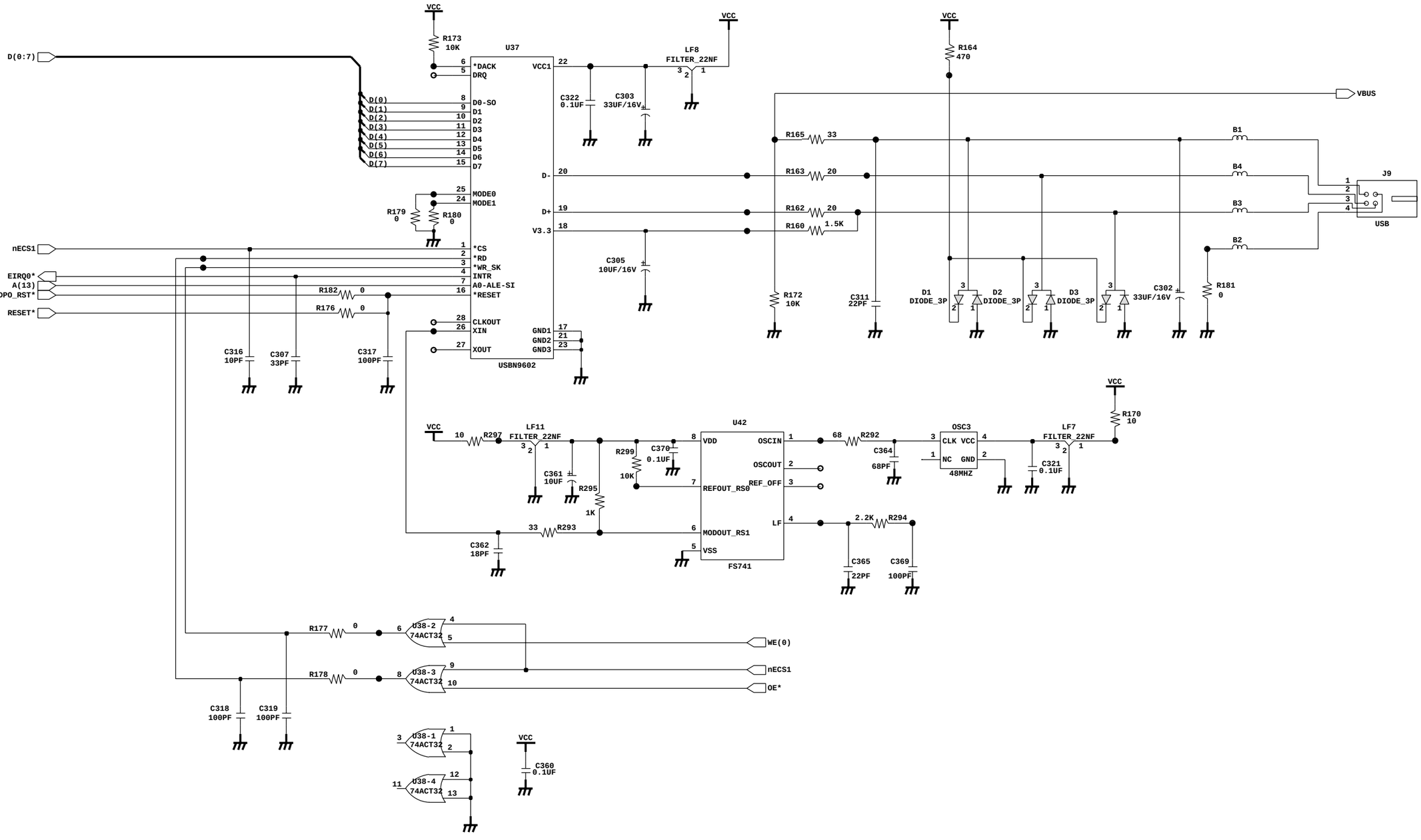
Controller Diagram(6/10)



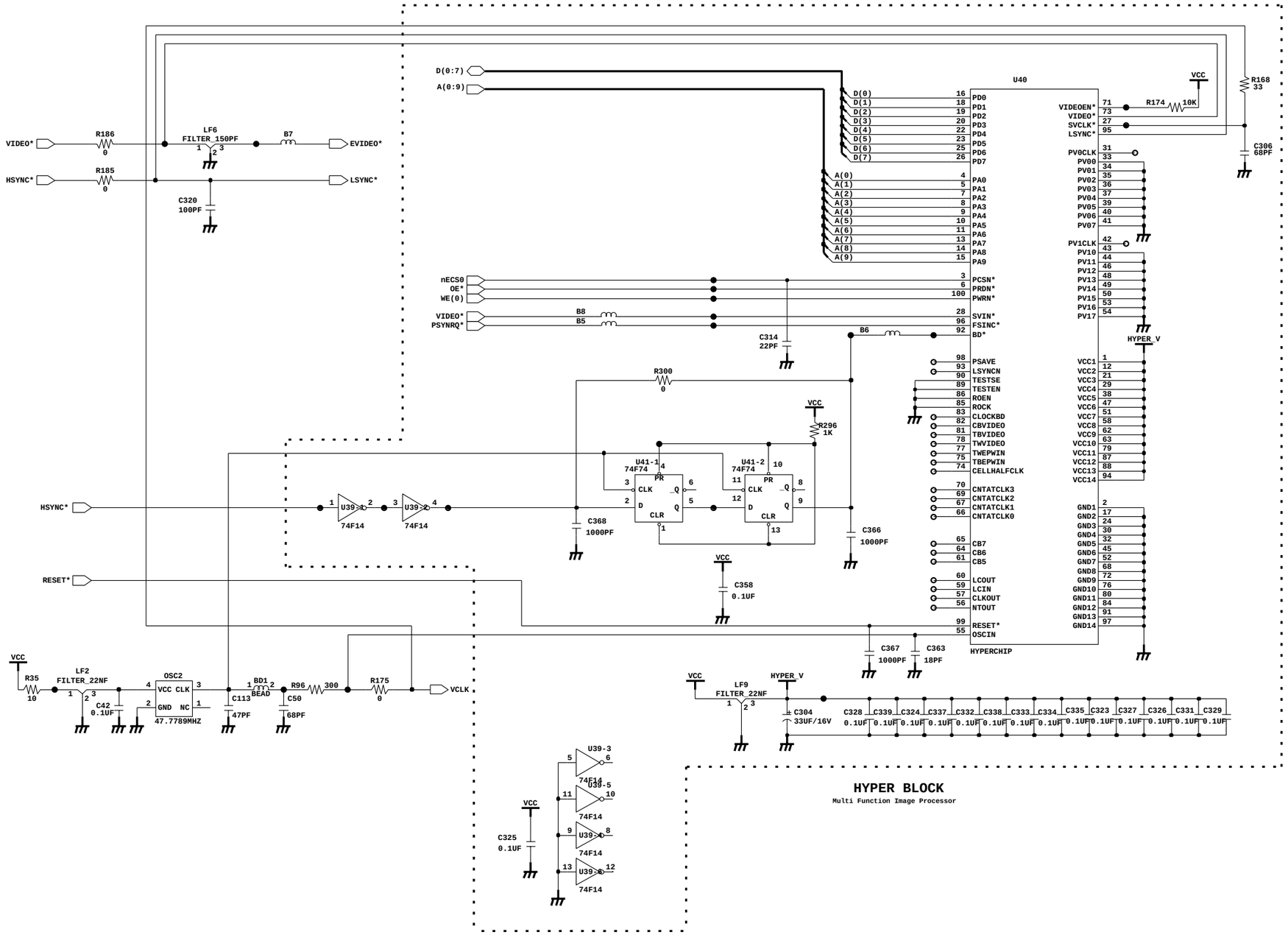
Controller Diagram(7/10)



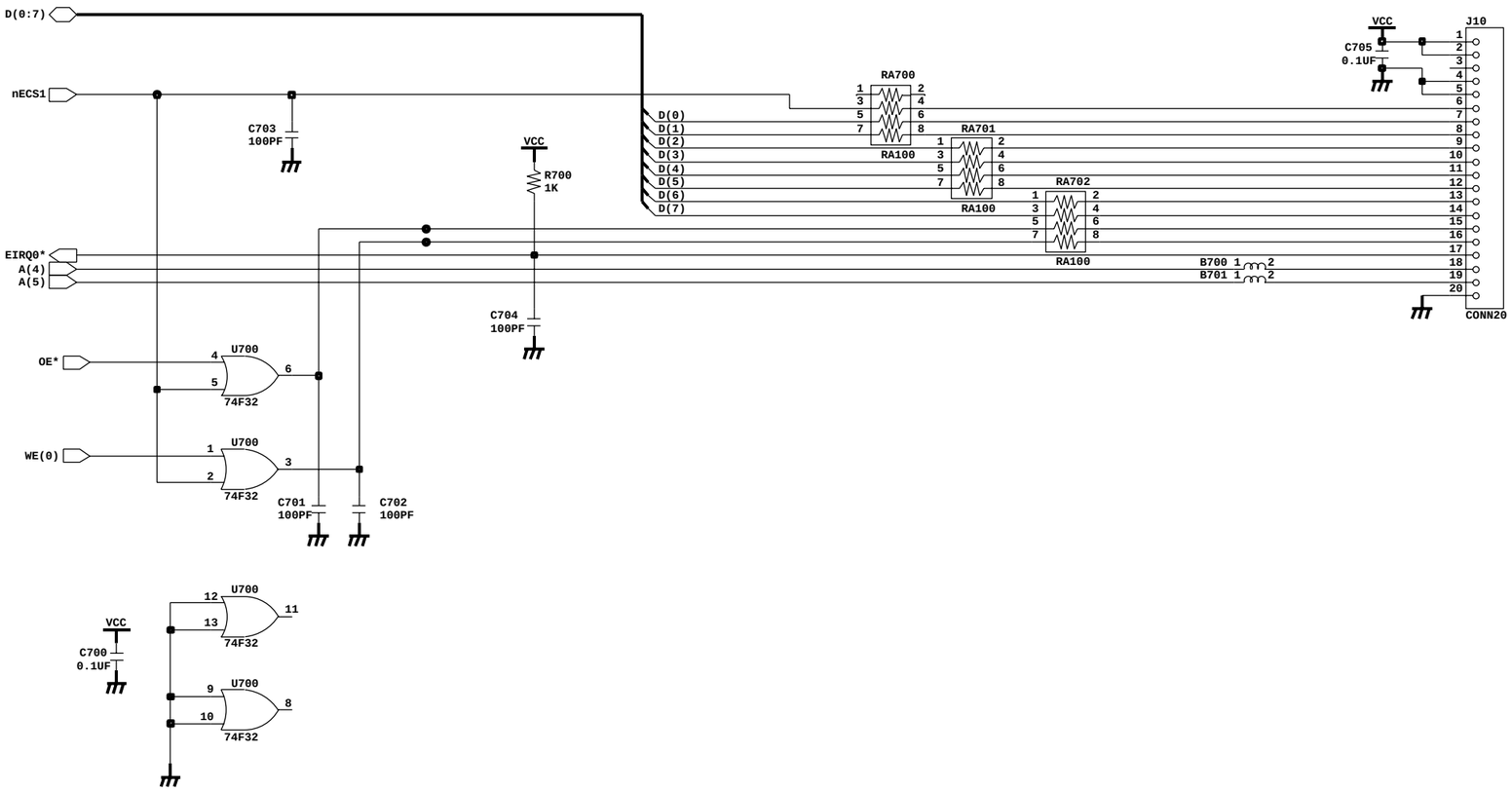
Controller Diagram(8/10)



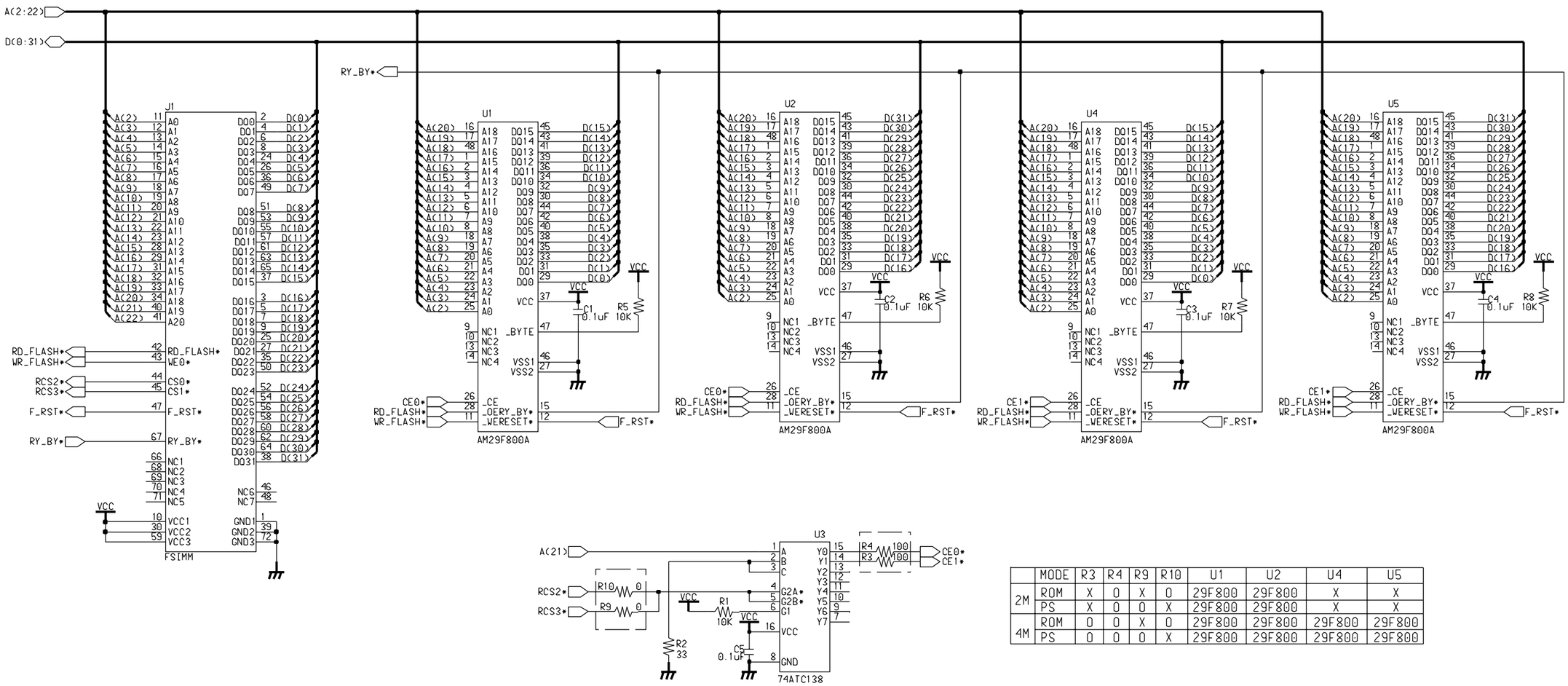
Controller Diagram(9/10)



Controller Diagram(10/10)

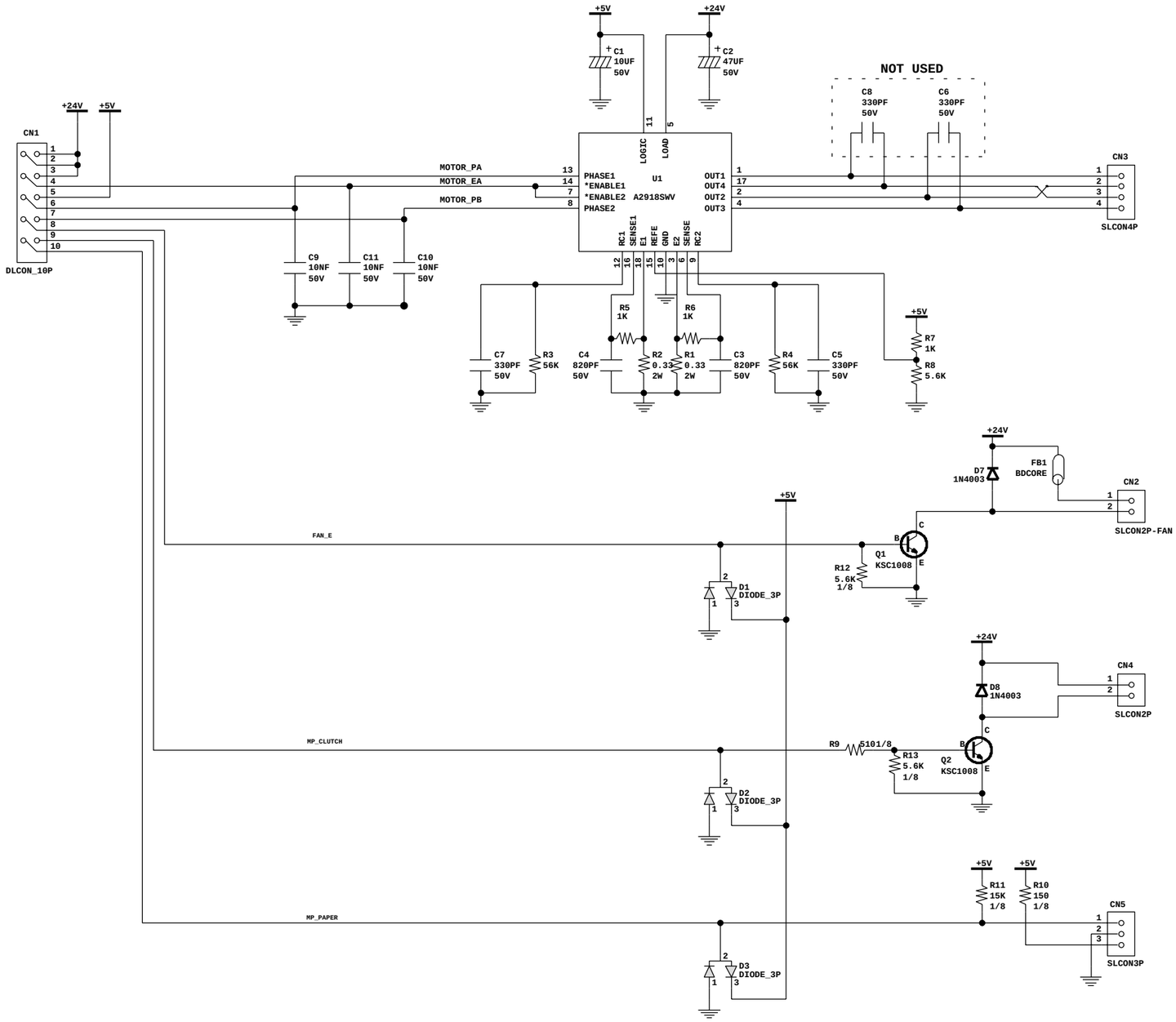
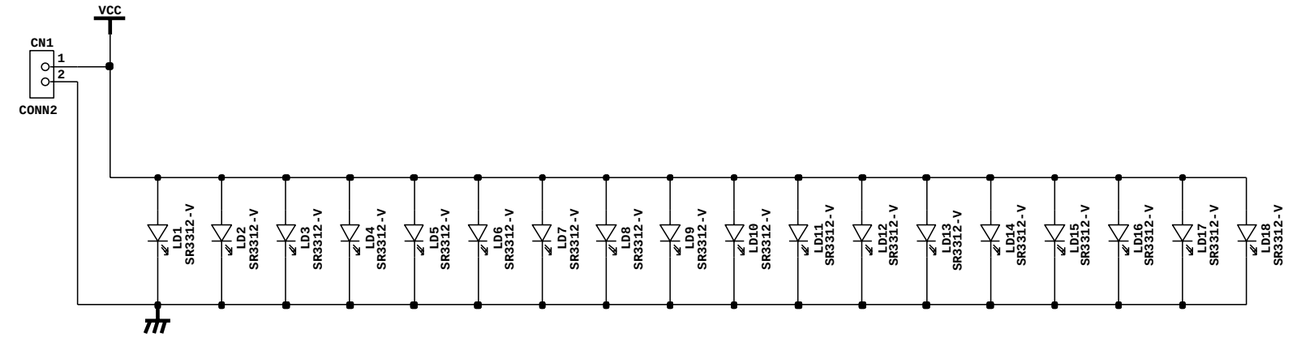


8-4. Flash SIMM



	MODE	R3	R4	R9	R10	U1	U2	U4	U5
2M	ROM	X	0	X	0	29F800	29F800	X	X
	PS	X	0	0	X	29F800	29F800	X	X
4M	ROM	0	0	X	0	29F800	29F800	29F800	29F800
	PS	0	0	0	X	29F800	29F800	29F800	29F800

8-6. Motor-SUB Board Diagram



8-7. PTL Diagram